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The Leader-Second Dyad: How Complementarity and Status Impact Collective Performance.

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The Leader-Second Dyad: How Complementarity and Status Impact Collective Performance.

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Dedication

I would like to dedicate this manuscript to my wife, whose love and support sustained me through all the difficult times.

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Abstract

The Leader-Second Dyad: How Complementarity and Status Impact Collective Performance.

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Abstract: Although leadership is one of the most well-studied topics in management, the role of the second-in-command (second) on teams and in organizations has been left largely unexplored. The handful of prior investigations into seconds have only examined the impact of their presence or absence in organizations. The investigation conducted here is among the first to explore how the characteristics of leader-second dyads influence the performance of the units they lead. A review of the limited literature on seconds, as well as a related literature on pooled leadership, suggests that the degree of similarity or difference between leaders and seconds can influence the dyad's effectiveness. However, prior research provides little insight into the types of differences that are important or the nature of the relationship between particular leader-second differences and effectiveness. Both for this reason, and because leader-second dyads are a largely unexplored phenomenon, I conducted a series of interviews with leaders and seconds. The results of this qualitative investigation focus attention on the constructs of personality, expertise, and status distance. To confirm and elaborate on these findings I conducted an archival study of leaders and seconds at the top of large firms, where they

are typically the CEO and COO of the organization. I find that leader-second differences in extraversion and openness improve collective performance, however, differences in agreeableness harm it. I also find that status distance moderates these effects such that lower distance makes the effects of personality differences more positive. The hypothesized effects of differences in expertise were not supported. These results suggest that characteristics of leader-second dyads, such as personality differences and status distance, have an impact on performance of the people these dyad lead.

Table of Contents

List of Tables

List of Figures

CHAPTER 1: INTRODUCTION

As the 30-foot-high flames raced toward them, their leader, to the astonishment of his men, lit a fire, lay down in the area it had burnt and ordered his men to join him. His second-in-command responded, “to hell with that, I’m getting out of here.” The leader survived the flames, but the second-in-command along with all but two of his fellow smokejumpers perished in the Mann Gulch fire (Weick, 1993). Weick’s description of the Mann Gulch disaster is a stark example of how impactful the relationship between a leader and their second-in-command can be. Had the second-in-command joined the leader it is likely that others would have followed and many more would have survived.

The importance of this leadership dyad is not limited to such extreme circumstances. Examples of the relationship between a leader and their second-in-command influencing the performance of their unit are plentiful in many domains, including business, sports, politics, and the military. In business, a decline in the previously productive partnership between then Apple Vice President Steve Jobs and CEO John Sculley contributed to missteps by Apple and led to the eventual ouster of Jobs (Weinberger, 2017). In contrast, the close relationship between Steve Jobs as CEO of Apple and his COO Tim Cook coincided with a period of extraordinary growth and prosperity for the company. In sports, New York Yankees manager Joe Torre attributed much of his success to his bench coach Don Zimmer (Miller, 2012). Both coaches had mediocre records as managers prior to working together, however, as a dyad, they led the Yankees to four world championships in five years. In politics, the fraught relationship between President John Adams and Vice President Thomas Jefferson undermined the Adams administration and contributed to the passage of the twelfth amendment, which permanently altered the way the

Vice President is selected (Wood, 2017). In the military, the disastrous "charge of the light brigade" is partially attributed to the cantankerous relationship between the Earl of Lucan, who commanded the cavalry overall, and the Earl of Cardigan, who was in charge of the Light Brigade (Brighton, 2004).

In each of the examples above, the performance of the group, team, or organization cannot be fully understood by examining the leader alone. To date, however, management scholarship has focused almost entirely on the leader him or herself. For example, Weick's (1993) analysis of the causes of the Mann Gulch disaster identifies several failures on the part of the leader but largely ignores the second-in-command. Weick's analysis is emblematic of a broader tendency to focus on leaders and perhaps over-attribute their unit's successes and failures to them (Meindl & Ehrlich, 1987; Meindl, Ehrlich, & Dukerich, 1985). This may be the reason why the second-in-command has been conspicuously absent from management research, despite being a key organizational player.

The extent to which the second-in-command, when present, has been overlooked is apparent even in the language used to describe the role. Unlike the terms leader and follower, which are well defined and clearly distinguished in the academic literature, there is no consensus term for the person who is just below the top position. In the popular press, the military term "second-in-command" is sometimes borrowed to describe the role. However, the terms "second fiddle", "second-banana", "number two", "second chair", "subordinate leader", and others have also been used (e.g. Bonem & Patterson, 2012, Hornsby, 2005; Hytner, 2014; Sheet & Jackson, 2011). This lack of a clear name for the role is, in part, indicative of how little research attention it has received.

The lack of research attention is even more surprising when one considers the range of job titles held by people in the role of second-in-command. Titles such as assistant branch manager, assistant store manager, chief operating officer, vice president, chief of staff, executive officer, associate pastor, associate head coach, vice principal, and senior associate dean (all part of my interview sample), are so varied and widespread that they highlight both the prevalence of the role in society and the disparity between that prevalence and the amount of scholarly emphasis devoted to it. In this dissertation, I attempt to address this disparity by bringing scholarly attention to the prevalent and impactful role of the second-in-command and especially to the impact of the leader-second dyad.

The first challenge in studying leader-second dyads is identifying them and differentiating them from other types of organizational hierarchy. Not all leaders have a second-in-command, therefore the identification of leader-second dyads hinges on a definition of the role of second-in-command that distinguishes it from other leader and follower roles. Although a lay understanding of the role exists, there is no readily available or widely accepted scholarly definition. Existing empirical research focuses on specific job titles rather than the role of the second-in-command as a whole (e.g. Bennett & Miles, 2006; Hambrick & Cannella, 2004; Zhang, 2006). Fortunately, a handful of popular press books, most of which are aimed at the second-in-command in churches, provide definitions that can act as a starting point for developing my own. Hornsby defines the second-in-command as "a subordinate leader [who] is not the first, not the primary, but is the minor, junior" (2005: 9). Sheets and Jackson called the second-in-command a "leader who serves another leader" (2011: 16). Bonem and Patterson define a second-in-command as "a person in a subordinate role whose influence with others adds value throughout the organization" (2012: 2). What these definitions have in common is that they

identify a second-in-command as someone who leads, but who is subordinate to another leader. The problem with these definitions is that they can be applied to anyone in an organizational hierarchy who is not at the very top or the very bottom. Because the second-in-command is a role that is present in some, but not all, groups, the definition should not include every manager who is a leader to some and a follower to others. I argue that what makes the second-in-command role unique is that leadership of a unit is *shared* in some form between the leader and the second-in-command. That is, seconds-in-command are engaged in a form of "pooled leadership" (Gronn, 2002; Denis, Langley, & Sergi, 2012) in which the leader-second dyad jointly provides the group's leadership while maintaining a readily observed and accepted hierarchy between them. With this in mind, I offer a definition of second-in-command as someone who shares direct leadership responsibility for a group or organization with another person, but to whom they are subordinate.

This definition highlights some of the key features of the second-in-command. To begin with, being second-in-command is best understood as a specialized leadership role within a group or organization. As with any role, it is conferred to an individual by others and comes with a set of agreed-upon expectations about how to behave (Katz & Kahn, 1966). Because it is a leadership role, those expectations include exerting social influence to direct the group to work toward shared goals (Yukl, 2010). But, as with any leadership role, the role of second-in-command may be formally or informally assigned. A person is a second-in-command (i.e. they are the role occupant) if they are assigned to and accept the role, regardless of whether or not they successfully fulfill role expectations (Yukl, 2010). Finally, this definition emphasizes the sharing of leadership responsibility between two people. This extends the conceptual focus from the second-in-command to the leader-second dyad. Other situations in which leadership

responsibility is shared by more than two people are discussed in my literature review but are, by definition, a different phenomenon that is outside the scope of this dissertation. In other words, for the purposes of this dissertation, leaders only have one second-in-command.

For ease of exposition in the remainder of this dissertation, I will use the term "second" rather than second-in-command. I will also use the term leader to refer to the superordinate member of the leader-second dyad. However, this is not meant to suggest that the second is not also a leader or that they are not engaged in leadership. I will use the term "follower" to refer to any other group members who are not the leader or the second.

The leader-second role structure presents some unique opportunities and challenges for collectives (organizations or teams/groups). On one hand, when leadership responsibility is at least partially shared by two people, the collective may be better able to respond to changing environmental conditions, balance competing demands, and tackle complex problems (Greenwood et al., 2011; Hunter, Cushenbery, & Jayne, 2017; Reay & Hinings, 2009). On the other hand, sharing leadership responsibility can lead to distrust, rivalry, and conflict among those in the leadership roles, which can be harmful to the collective (Denis et al., 2012). Whether the positive or negative effects of such a shared leadership structure predominate is likely to depend on the interpersonal dynamics of the specific leader-second dyad, and the power structure between them (Krause, Priem, & Love, 2015; Marcel, 2009). Therefore, as the earlier examples suggest, *seconds should not be considered in isolation*. Instead, I will focus on the leader-second dyad as the unit of analysis. The goal of my research is to identify which characteristics of a leader-second dyad make it more or less effective, with a particular focus on personality, expertise, and status differences. This exploration helps to advance our knowledge about

leadership and begins to incorporate a long-neglected, but important, member of groups and organizations into our understanding of their functioning.

This proposal is divided into seven chapters. Following this introduction, Chapter 2 reviews the existing literature on seconds. This review is divided into two parts. Part one reviews the strategic management literature that examines seconds at the top of organizations. Part two reviews the literature on plural forms of leadership that are similar to but distinct from leader-second dyads. Chapter 3 presents some insights that were gathered from a series of structured interviews with leaders and seconds. Because leader-second dyads are largely unexplored, there is little existing literature from which to draw directly when developing my hypotheses and designing my study. The qualitative data I have gathered in these interviews helps orient my research proposal and guides the development of hypotheses in Chapter 4. Chapter 5 outlines my deductive, quantitative investigation of leader-second dyads. This study uses archival data on CEOs and COOs to examine the effects of leader-second dyads on collective performance. I combine text data from earnings call transcripts with data gathered from various other databases to examine the relationships between the personality, expertise, and status distance in the CEO-COO dyad and firm performance. Chapter 6 presents the results of my quantitative archival study. I find that differences in extraversion, openness, and agreeableness have a significant impact on collective performance, and that these effects are moderated by status distance. Finally, Chapter 7 contains the discussion of my results, contributions, and the limitations of this study.

CHAPTER 2: LITERATURE REVIEW

Prior research on seconds per se is extremely limited. The scant scholarship that does exist comes primarily from strategic management investigations into seconds at the top of organizations, where they are typically in the role of COO or President (e.g. Bennett & Miles, 2006; Hambrick & Cannella, 2004; Zhang, 2006). I review this literature in the first section of this chapter. However, because the direct work on seconds is so restricted, I also review selected research in the domains of leader succession and plural forms of leadership. Although research in these domains does not directly examine seconds or the leader-second dyad, it does address phenomena with similar features. Research on leader succession explores the role of heir apparents, who occupy a similar position in the organizational hierarchy as seconds and who are considered by some to be a type of second (e.g. Bennett & Miles, 2006). Plural leadership examines "the combined influence of multiple leaders in specific organizational situations" (Denis et al., 2012: 211). Because leaders and seconds share leadership responsibility, work in this domain can provide insight into my focal phenomenon.

Upper Echelons

Limited investigation of seconds at the top of organizations has taken place within the upper echelons perspective of strategic management. Upper echelons research examines the link between the characteristics of top executives and the firm's behavior and performance (Finkelstein & Hambrick, 1996; Hambrick & Mason, 1984). This perspective places emphasis on the top management team (TMT) as a unit of analysis (Hambrick, 2007; Hambrick & Mason, 1984). The TMT typically consists of a handful of executives who are involved in the strategic decision-making process. Although Hambrick and Mason (1984) emphasized the importance of

examining the entire TMT, the upper echelons perspective also includes studies linking individual TMT member characteristics to firm level outcomes (Hambrick, 2007; Menz, 2012). The vast majority of studies of individual TMT members have examined the CEO (Carpenter, Geletkanycz, & Sanders, 2004; Hambrick, 2007; Menz, 2012). However, a small number of studies have investigated the roles of COO and President, which are typically considered the organization's second-in-command (e.g. Hambrick & Cannella, 2004; Marcel, 2009; Zhang, 2006).

A complete review of upper echelons research is well beyond the scope of this proposal. The work in this area is so vast that a 2004 review of the literature was limited to only those papers published since a prior review in 1996 (Carpenter et al., 2004). To maintain a manageable scope, I have limited my review to only on those papers that directly or indirectly examine seconds.

Overview. Hambrick and Mason's (1984) original formulation of upper echelons theory rested on two major premises. First, executives behave differently from one another based on their personalized interpretations of the situation. Second, executives' interpretations are driven by their "experiences, values, and personalities" (Hambrick, 2007: 334). Because TMT members have influence over the strategic decisions of the firm, the firm's strategic direction and ultimately its performance are influenced by the experiences, values, and personalities of its executives. Hambrick and Mason's (1984) argument was a direct rebuke to perspectives of the firm that deemphasized the role of executives and instead treated the firm and its members as rational actors responding to objective features of the environment.

In addition to putting forth a theory of the actions of a firm, Hambrick and Mason (1984) deliberately laid a foundation for future empirical work. Because the psychological characteristics of TMT members are often difficult to obtain directly, Hambrick and Mason argued that researchers should initially focus on demographic characteristics. These easily observable features were presumed to act as a proxy for deeper psychological differences. This approach spawned a vigorous stream of research, but it left the underlying psychological and social processes under-explored (Bromiley & Rau, 2016; Carpenter et al., 2004; Hambrick, 2007; Lawrence, 1997). This dissertation focuses squarely on the psychological and social features of the TMT by examining the effects of both expertise and personality differences, and the status distance between the CEO and COO.

Hambrick and Mason's (1984) perspective has received widespread study and support. Research has consistently linked characteristics of the TMT to firm strategy and performance (Bromiley & Rau, 2016; Carpenter et al., 2004). The literature has also extended the original theory, identifying antecedents to TMT composition and adding new mediators, moderators, and outcomes to the original model (Bromiley & Rau, 2016; Carpenter et al., 2004; Hambrick 2007).

Chief Operating Officers (COOs). A handful of studies have directly examined seconds in TMTs. Typically, seconds at the top of large organizations have the title of COO. However, prior studies have also considered those individuals (other than the CEO) with the title of President to be a second (e.g. Hambrick & Cannella, 2004; Marcel, 2009; Zhang, 2006). For ease of exposition, I refer to all of these individuals as COOs, even when the operationalization includes executives with the title of President. Unlike other members of the TMT, COOs are not usually delegated responsibility for a subunit or functional area; instead, they are responsible for the whole organization (Bennett & Miles, 2006; Hambrick & Cannella, 2004). According to

Hambrick and Cannella (2004: 959), a "CEO assigns to the COO a significant part of the role set usually associated with the CEO position, including the roles of directing and coordinating, disturbance handler, and resource allocator, and, it might be said, even the leadership role itself." Based on this description, COOs meet the definition of seconds presented in the introduction of this proposal.

One of the first studies of COOs in the strategic management literature came from Hambrick and Cannella (2004). These authors were interested in studying COOs because the decision to have a second, and the impact of their presence on the firm, had previously been unexplored. Because their focus was on COOs who were exclusively in the role of second-in-command, the authors excluded from their theorizing COOs who were also the "heir apparent" to the CEO. To validate their understanding of the COO role, the authors interviewed 13 CEOs and 8 COOs. These interviews confirmed their notion that the COO was indeed a second-in-command. They also found that the typical division of labor gave the COO most of the responsibility for internal operations and the CEO primary responsibility for external and longer-term issues. The remainder of their study was focused on understanding the antecedents and consequences of having a COO. The authors found that the likelihood of having a COO increased with the size of the firm, and when the CEO lacked experience with operational activities or with prior management in the focal firm. In contrast to their hypotheses, they did not find evidence that the characteristics of the firm's industry – such as the degree of dynamism or capital intensity – had an impact on the likelihood of having COO. Although the authors hypothesized that there would be contingent effects of COO presence on performance, they also found little support for these hypotheses. Industry dynamism, organizational task demands, and CEO experience did not alter the relationship between COO presence and firm performance.

Instead, the authors found a negative main effect such that the presence of a COO harmed firm performance (which was measured as both return on assests and market to book ratio). The sole exception was in very large firms – those with more than $9 billion in sales – where the effect was reversed.

This initial study of seconds established the importance of the role by demonstrating a link between their presence and the performance of the collective. However, the failure to find the hypothesized contingency effects suggests that neither the environment nor the characteristics of the leader alone determine the effectiveness of the leader-second dyad.

In a study building on the work of Hambrick and Cannella, Zhang (2006) examined the impact of COO presence on strategic change and CEO dismissal. Unlike Hambrick and Cannella (2004), Zhang described COOs as playing either the role of co-leader or heir apparent. In both roles, the COO typically acted like a partner to the CEO, working together to meet organizational goals. However, Zhang argued that under some conditions, such as during periods of poor performance, the COO can become a rival to the CEO. In support of this argument, Zhang found that the presence of a COO increased the magnitude of strategic change when firm performance was poor but decreased it when performance was high. In addition, when firm performance was poor, the presence of a COO increased the likelihood of CEO dismissal and this effect was stronger when there was more strategic change. However, when firm performance was high, the presence of a COO did not affect CEO dismissal. Zhang (2006) did not directly examine the interpersonal dynamics of the leader-second dyad, however, his findings were consistent with his theorizing that firm strategic change is affected by the relationship between the CEO and COO. That is, although Zhang measured only the presence or absence of a second, his findings suggest that features of the leader-second dyad are likely to affect firm outcomes.

Marcel (2009) conducted a study, similar to that of Hambrick and Cannella, in which he examined the impact of COO presence on firm performance. Like Hambrick and Cannella, Marcel set aside heir apparent COOs. Marcel argued that -- despite the difficulty of sharing leadership responsibilities and additional costs of employing a COO -- the information processing benefits of having a COO would likely improve firm performance. In contradiction to Hambrick and Cannella's (2004) finding, Marcel found that COO presence was associated with an increase in firm performance. The author suggested that this discrepancy may be the result of differences in sample characteristics and data analysis. Most notably, Marcel's sample included only industrial firms and the firms were somewhat larger in size than Hambrick and Cannella's. Marcel also found that the benefits of having a COO increased when TMT functional diversity was low, TMT tenure heterogeneity was high, and TMT average age was high.

The contradiction between Marcel's finding and Hambrick and Cannella's suggests that the relationship between the presence of a second and collective performance is more complex than it first appeared. These inconsistent results further reinforce the need to examine the lead-second dyad itself. In a review of the research on functional TMT members (e.g. COO, CIO, CMO, CSO, CFO, etc.), Menz (2012) echoed this sentiment by arguing that there is a need for more research that goes beyond the antecedents and consequences of their mere presence, which has been the focus of these prior studies of COOs.

In addition to the three archival studies discussed above, two practitioner-focused articles on COOs have been published. Levinson (1993), writing in the Academy of Management Executive, drew on his extensive experience in working with executives to describe some of the pitfalls of the CEO – COO relationship. He considered the COO to be the likely successor to the CEO and argued that this inevitability created feelings of rivalry between the two. Levinson went

on to argue that problems between a CEO and COO tend to emerge for one of five reasons. These included an inadequate selection process that chooses a poor match, personality features that lead to aberrant behavior, misconceptions about their respective roles, guilt on the part of the CEO, and changes in the business environment. Finally, Levinson offered a number of suggestions for how to avoid these problems.

Bennett and Miles (2006) presented a typology of COOs and gave advice to both CEOs and COOs for making the relationship work. Their findings were based on an unspecified number of in-depth conversations with CEOs and COOs. Bennett and Miles recognized that the COO is the "second-in-command executive" but argued that beyond such a characterization, there was little consistency in the role from one COO to the next. They suggested that there are seven different types of COOs, although they acknowledged that some COOs fit into more than one type. The *executor* is primarily concerned with the implementation of strategies developed by the TMT. The *change agent* is brought in to lead a specific strategic imperative. The *mentor* helps to coach young or inexperienced CEOS. The *other half* is a COO that acts as a complement to the CEO's experience, style, knowledge, or behavioral tendencies. The *partner* is a co-leader to the CEO. The *heir apparent* is the planned successor that is being groomed to be CEO. Finally, the *MVP* is a high potential executive who is not the heir apparent, but who has been given the COO position in an effort to retain them. Bennett and Miles emphasized the importance of trust between the CEO and COO. They also offered advice for people in both roles, including the need for respect, to keep egos in check, to communicate, to have clear decision-making rights, and to share the spotlight. The recommendations offered by these practitioner-focused articles provide further support for the notion that consideration must be given to the leader-second dyad as a whole, rather than to either party individually.

CEO succession. The literature on leader succession and heir apparents predates the upper echelons perspective (Giambatista, Rowe, & Riaz, 2005). However, the introduction of upper echelons theory encouraged the development of studies that examined the impact of heir apparents on firm outcomes. The heir apparent is an organizational insider (typically a TMT member) who is being groomed to replace the CEO (Vancil, 1987). Studies reviewed in the prior section either excluded COOs who were the heir apparent or included them in their sample along with other types of seconds. In this section, I review the literature that focuses only on those seconds who are heir apparents and evaluates just their impact on the firm. I do not review the literature that focuses on the succession process itself, such as when an heir apparent is likely to be promoted to CEO (e.g. Cannella & Lubatkin, 1993; Cannella & Shen, 2001).

Studies of heir apparent's impact on firm outcomes have concentrated on the relationship between their presence and firm performance, both before and after a succession takes place. Behn, Riley, and Yang (2005) found that immediately following the death of a CEO, firms with an heir apparent experience higher equity market returns. Shen and Cannella (2003) found that markets do not react to the appointment of an heir apparent, however, they react positively to the promotion of an heir apparent and negatively to their exit prior to promotion. They also found that markets have a negative reaction to the appointment of an insider CEO successor who was not the heir apparent, and a positive reaction to an outside CEO successor. Shen and Cannella also examined the moderating effect of firm performance and found that the positive effect of heir apparent promotion and the negative effect of heir apparent exit were strengthened as firm performance increased.

Davidson, Nemec, and Worrell (2001) conducted a study of heir apparents in response to a commentary by Harris and Helfat (1998) which reinterpreted their data from an earlier study

(Worrell, Nemec, & Davidson, 1997). They examined stock market reactions to announced changes in titles and found support for Harris and Helfat's (1998) reinterpretation of their data. What had previously appeared to be a negative stock market reaction to the announcement of CEO plurality (when a CEO holds multiple titles, such as Chairmen of the Board, CEO, and President), was actually a negative reaction to the loss of an heir apparent. Announcements of CEO duality and plurality did not have any effect on stock prices, as long as the CEO still had an heir apparent.

Zhang and Rajagopalan (2004) examined both the antecedents and consequences of "relay" CEO successions. A relay succession occurs when an incumbent CEO designates an heir apparent and then works with them to pass on the baton of leadership (Vacil, 1987). They found that the likelihood of relay succession is negatively associated with the number of internal candidates and positively associated with pre-succession firm performance. They also found that relay successions led to better post-succession firm performance, particularly when pre-succession firm performance was low or when post-succession strategic and industry instability was high.

Overall, this stream of research suggests that firm performance is positively influenced by the presence of an heir apparent and by their eventual ascension to CEO. Although none of the studies directly examine the characteristics of the heir apparent or the CEO, the implication is that heirs have this effect because they are similar to the CEO and can maintain continuity. Although heir apparent COOs are likely chosen because of their similarity to the CEO, other types of COOs may be chosen because they are different. In his review of functional TMT members, Menz (2012: 70) argued that "functional TMT members, particularly second in commands such as COOs, may be selected because they compensate for a CEO's lack of skills in

a particular functional area as well as for his or her lack of firm-specific experience." This suggests that heir apparents may serve a different role than other types of seconds. This difference between the two streams of research also raises the question of whether complementarity or similarity is better in a leader-second dyad.

Plural Forms of Leadership

Although seconds have gone largely unexplored outside of strategic management, plural forms of leadership have received considerable attention. Plural leadership involves the combined influence of multiple people in assigned or assumed leadership roles (Denis et al., 2012). This literature treats leadership as a collective phenomenon that can be distributed or shared by more than one person. In a recent review, Denis et al (2012) distilled the many labels and inconsistent definitions into a four-way typology of shared leadership, pooled leadership, distributed leadership, and relational leadership.

Shared leadership focuses on mutual influence in groups. In shared leadership situations, members lead each other. There is typically no designated leader and the person providing leadership can change from one situation to the next.

Pooled leadership describes situations in which a small number of people jointly share leadership responsibility for a group. Often, this research examines dyads and triads, although it can involve small groups of more than three people. Research on leader-second dyads would fall into this category.

Distributed leadership describes situations in which leadership is handed from one person to the next. At any point in time, there is a single leader. It can be thought of as a relay race in which leadership goes from one person to the next.

Finally, relational leadership research treats leadership as an emergent property of social relations. This work is firmly rooted in the social constructivist perspective. It views leadership as inherently plural because it must be co-created by leaders and followers.

Because the leader-second dyad can best be described as a form of pooled leadership, I limited my review to research in this vein. In a review of the pooled leadership literature, Gronn (2002) argued that research up to that date had been too focused on the individual leader as the unit of analysis, and that there should be a shift from focusing on individuals to examining small groups of leaders. He reviewed research that studied situations in which a limited number of people (usually four or fewer) jointly shared leadership responsibility. Gronn acknowledged that some hierarchy may exist within leadership groups (as is the case in leader-second dyads), but he focused his attention on the sharing of leadership and the collective contributions of all members. In his review, Gronn identified only eight studies that examined leadership dyads. He developed a taxonomy of existing research based on the size of the leadership group being studied, how closely the group collaborated, and the extent to which the distribution of leadership was institutionalized. He also described some of the characteristics of these leadership groups, noting that they differed in the extent to which their roles overlapped or were complementary.

The majority of research on pooled leadership has sought to defend this organizational form against critics who question its long-term viability (Denis et al., 2012). These studies are primarily concerned with showing that pooled leadership structures can operate effectively. For example, Hodgson, Levinson, and Zaleznik (1965) conducted an in-depth case study of a group of three people jointly providing leadership to a psychiatric hospital. They concluded that the group successfully shared leadership responsibility by having roles that were specialized (each person had their own, limited, area of expertise), differentiated (roles had minimal overlap), and

complementary (together, they covered all areas of leadership that were needed). Hodgson et al. (1965) built this work on earlier team studies by Bales (1950; Bales & Slater, 1955) that found that two informal leaders typically emerged in groups: one focused on the group's tasks (group locomotion specialization) and the other focused on the socioemotional needs of the group members (group maintenance specialization). Rarely were these two leadership roles taken on by the same person (McGrath, 1984).

More recent studies support Hodgson et al.'s (1965) finding that pooled leadership structures are most viable when roles are both complementary and differentiated. Denis, Lamothe, and Langley (2001) conducted a five-case study of change in healthcare organizations. They found that change was achieved through the creation of a small leadership group in which members had complementary roles. Gronn (1999) conducted a single case study of a "leadership couple" and concluded that the keys to joint sharing of leadership were: prior experience working together, reciprocity, trust, individual discretion, and complementary dispositions. Steward (1991), in a longitudinal study of 20 executives in the UK National Health Service, found that the most common type of relationship between hospital general managers and chairmen was that of complementary partners. Finally, in a single case study of co-principals in schools, Gronn and Hamilton (2004) noted the importance of interdependence, trust, and complementarity.

The practitioner-oriented literature has also emphasized the need for distinct but complementary roles among pooled leaders. Heenan and Bennis' (1999) book examined ten historical pairs of co-leaders in both business and politics. They argued that pooled leadership is most beneficial when leaders have non-overlapping talents and responsibilities. O'Toole, Galbraith, and Lawler (2002) drew similar lessons from their examination of historical co-

leaders. They emphasized the importance of having different but complementary roles and having robust mechanisms for coordination. Alvarez, Svejenova, and Vives (2007) argued that co-heads of an organization need distinct roles and complementary expertise, experiences, skills, styles, and networks. Sally (2002) was the sole author not to explicitly focus on the need for complementarity. He offered lessons based on an examination of co-leadership in the Roman Republic, which focused on building a system that created mutual dependence between leaders and minimized competition. Sally acknowledged that complementarity was sometimes advantageous, but argued that differences between co-leaders could also be a source of conflict.

A handful of studies have gone beyond describing the nature pooled leadership structures to examine the consequences of this type of leadership. All of these studies have involved co-CEOs (I review these studies here rather than in the upper echelons section because they do not involve a second or an heir apparent). In a theory paper, Hunter et al. (2017) argued that having co-CEOs helps firms manage the exploration-exploitation dilemma and increase innovation. They recommended that co-CEO's have complementary roles, with one focused on exploration and the other on exploitation. Arena, Ferris, and Unlu (2011) found that co-CEOs typically have complementary skill sets and that the market reacts positively to their appointment. Finally, Krause et al. (2015) examined the power gap between co-CEOs and found a curvilinear relationship between its size and firm performance.

Overall, this review of the pooled leadership literature exposes two notable features of prior research. First, although Gronn (2002) suggested that some hierarchy may exist in pooled leadership groups, the vast majority of studies involve dyads or groups in which there was no formal hierarchy. Steward's (1991) investigation of general managers and chairmen in health care was the only study in which such a clear formal hierarchy was present. However, Steward

emphasized the tendency of these pairs to work as equal partners despite this hierarchy. The baseline assumption appears to be that there is little to no status distance between members of pooled leadership dyads or groups. This obviously contrasts with earlier research from strategic management, where the COO was a clear number two to the CEO. Second, there is a heavy emphasis on the need for non-overlapping or complementary roles, but, little attention is paid to the underlying traits of the leaders which might help to create these roles. The literature is chiefly concerned with how best to structure roles in pooled leadership groups. The largely implicit assumption is that these groups exist because the leaders in them have a variety of different strengths, however, this assumption goes largely unexamined. In Chapter 4, I will discuss how differences in traits, such as personality and expertise, along with the structure of the status hierarchy (i.e. status distance) can make such complementary roles more or less likely to emerge.

Discussion

My review reveals that seconds have rarely been studied. The TMT literature contains a small number of studies of seconds, all of which examine the consequences of the presence or absence of the second. These studies provide little insight into what makes seconds more or less effective when they are present. In contrast, the pooled-leadership literature does examine the conditions under which leadership pairs are most effective, but these findings come almost exclusively in studies where there is no clear hierarchy within the leadership group. Fortunately, these literatures do suggest some avenues for further investigation.

One principal question that emerges is whether it is better for leaders and seconds to be similar or complementary. The leader succession and pooled leadership literatures imply different conclusions. The succession literature assumes that the CEO chooses their successor and that they will generally pick someone who is as similar to them as possible (Cannella &

Holcomb, 2005; Menz, 2012). The presence of this highly similar heir apparent tends to improve market perceptions and firm performance. On the other hand, the pooled leadership literature assumes that shared leadership structures emerge to take advantage of complementarities in ability, temperament, and disposition, and therefore leaders and seconds are likely to benefit from being different from each other (Alvarez et al., 2007; Denis et al., 2012).

Another insight that emerges from this review is the need to study differences in the underlying psychology of leaders and seconds. The TMT literature has traditionally focused on observable (demographic) characteristics of senior leaders which are assumed to serve as markers of differences in their underlying psychology (Hambrick & Mason, 1984). The focus on observable characteristics was necessary because of the difficulty of obtaining direct measures of TMT members' psychological characteristics (Chatterjee & Hambrick, 2007). It was also argued that researchers should focus on observable characteristics because this information was readily available to decision-makers, whereas, information about psychological characteristics was not (Hambrick & Mason, 1984). However, in recent years the TMT literature has increasingly begun to find ways to assess the psychological characteristics of TMT members (Bromiley & Rau, 2016). This shift has occurred because of methodological developments that make it possible to obtain indirect measures (e.g. Chatterjee & Hambrick, 2007, 2011) and because the psychological characteristics of employees are increasingly obtained by firms for both developmental purposes and for use in selection decisions (Meinert, 2015). An examination of the underlying psychology of leaders and seconds would also represent a significant contribution to the pooled-leadership literature, which until now has largely focused on the complementarity of roles rather than of people. Pooled leadership structures presumably emerge from the need for leaders to have a variety of different psychological characteristics (Gronn, 2002; Hunter et al.,

2017). Yet, researchers have not assessed what type or to what degree these differences are present and contribute to the effectiveness of the larger group.

Finally, my review suggests there is a need to consider the status distance between leaders and seconds. The TMT and the pooled leadership literatures differ in the extent to which hierarchy is present in the contexts they study. With the exception of a handful of papers on co-CEOs, studies of TMTs assume that a clear hierarchy exists between the CEO and the rest of the team. On the other hand, investigations into pooled leadership almost exclusively examine situations in which there is little established hierarchy within a group of leaders. Because the degree of hierarchy between co-leaders and within leadership groups can have a significant impact on group processes and performance (Bunderson, 2003; Bunderson & Van der Vegt, 2018; Krause et al., 2015), consideration must be given to this discrepancy between the two literatures when building my theory. This task is made more difficult by the fact that *the presence of any formal hierarchy may be less informative than the hierarchical distance between people* (e.g. Doyle, Lount, Wilk, & Pettit, 2016). By definition, a formal hierarchy exists in leader-second relationships but not in co-leader arrangements. However, seconds can sometimes act as nearly equal partners with their leader (Zhang, 2006), and co-leaders can develop large hierarchical distance between one another (Krause et al., 2015). The rank-ordering of leader and second may obscure vast differences in of *amount* hierarchical distance that is present from one dyad to the next. Because the leader's and second's positions in the status hierarchy are fixed, my focus will be the status distance between them, which is defined as the magnitude of the difference in status (Blau, 1977).

In the next chapter, I present a preliminary exploratory investigation that begins to examine each of these issues in the context of leader-second dyads.

CHAPTER 3: EXPLORATORY INVESTIGATION

Existing theory provides little insight into which features of a leader-second dyad are likely to influence its effectiveness. Strategic management scholarship has investigated the presence or absence of seconds. Organizational behavior research has primarily focused on the processes that allow shared leadership structures to function and has predominantly been concerned with co-leaders rather than seconds. Because there is so little well-developed theory it may be premature to first design a quantitative deductive study to examine the phenomenon. In situations such as this, where prior theory is absent or poorly developed, inductive qualitative methods can be an effective approach (Graebner, Martin, & Roundy, 2012). Therefore, I conducted a series of structured interviews with leaders and seconds, which I describe and summarize in this chapter. I use the insights gained from these interviews to further guide the development of testable propositions in Chapter 4.

Sample

I collected structured interview data from 36 current and former seconds and from 11 of their leaders. To maximize the generalizability of my findings I relied on theoretical sampling (Eisenhardt, 1989) to select leaders and seconds from a broad range of industries, organization sizes, and organizational levels (see Tables 1 and 2). The majority of the participants were recruited using cold calls and emails. I contacted 42 seconds, 30 of whom agreed to be interviewed. The 71 percent response rate reflects an enthusiasm for this research topic among people who are or have been seconds. The remaining six seconds were recruited from extensions of my personal social network. Several months later I contacted the leaders of each participant

who was still serving in the role of second and whose leader had not changed. Eleven of the 23 leaders I contacted agreed to be interviewed.

The final sample included leaders and seconds in organizations ranging in size from 4 to 325,000 employees. The interviewees were employed in a wide variety of industries, including for-profit, non-profit, military, educational, sports, religious, and governmental organizations. The sample also included leaders and seconds from all different levels of their organizations, ranging from CEO-COOs to store managers and assistant store managers.

Method

My initial plan was to conduct all of the interviews using a standardized open-ended question approach (Patton, 2002). This technique relies on a set of carefully worded and predefined questions that are read verbatim to interviewees. The main advantages of this approach are the efficient use of limited interview time and reduced variability in the interpretation of questions by interviewees, which makes it easier to compare responses across individuals (Patton, 2002). To begin, I developed a series of questions intended to elicit information about each leader-second dyad and what made it more or less effective (see Appendices A and B). The primary reasons for conducting this qualitative investigation were my need to induce ideas that could inform my later hypothesis development, and the need to understand how the existing literature may or may not apply to the organic experiences of leader-second dyads. With those goals in mind, I incorporated questions designed to help me understand how leader-second dyads operate and how they were different from either individual leaders or co-leaders. That led to the inclusion of questions about the role of the second, how that role was different from the role of the leader, and how the leader and second interacted. In addition, based

on my literature review, I included questions about the ways in which and the degree to which leaders and seconds were similar or dissimilar and the amount of status distance between them.

After my first three interviews with seconds, I reevaluated my use of standardized open-ended questions because of an issue that had begun to emerge. Seconds were hesitant to disclose information about the problems they had with their own leaders. This was partly a consequence of the leader's formal authority over the second and the dangers of publically criticizing someone with power over them. In addition, several interviewees emphasized the importance of publically supporting their leader, even when they disagreed with their decisions or policies, because they believed it was part of their responsibilities as a second. To overcome interviewee's tendency to provide an overly optimistic account of their leader-second dyad, I needed to rapidly build a rapport that allowed them to see me as a confidant rather than a member of the general public. The formality of the verbatim reading of standardized questions made building such a rapport difficult.

For the remaining interviews with both leaders and seconds, I altered my approach. I retained the questions in Appendices A and B, however, I used these questions as an interview guide rather than asking them verbatim. Doing so allowed me to have a more flexible and conversational interview while still ensuring that certain topics were covered (Patton, 2002). This allowed me to build trust with interviewees, to explore a broader range of topics, and to capture the interviewee's frank assessments of the leader-second dyad.

Although my questions focused on interviewees' current dyad, many had previously worked in other leader-second dyads. These interviewees would often compare and contrast their

experiences in different dyads. As a result, the number of dyads for which I have data exceeds the number of interviewees.

I requested a 30-minute interview with each participant and checked in with them at the 30-minute mark. However, the majority of the interviews (40 of 47) ran longer than 30 minutes, with an average length of 58 minutes. Eight of the interviews were conducted over the phone, the remaining 39 interviews were conducted in person. All but three of the participants agreed to have their interview recorded for later transcription.

Data Analysis

I drew on grounded theory techniques to gain a better understanding of my data (Strauss & Corbin, 1990). I first transcribed the recordings using a combination of self-transcription, computer-aided transcription, and a transcribing service. I then coded the transcripts using QDA Miner Lite. I began with open coding of the basic concepts. After coding some basic concepts, such as personality, I began combining them into higher order codes, such as leader-second personality similarity. A list of codes that I retained appears in Appendix C. After open coding, I looked for links between concepts and tried to develop a broader theoretical understanding of my data (Charmaz, 2006; Strauss & Corbin, 1990). I used the constant comparison method of analyzing the data throughout the collection phase, beginning my analysis after the first three interviews were transcribed (Glaser & Strauss, 1967). I tested emerging ideas against newly collected data and repeatedly returned to open coding to identify additional concepts that had been previously overlooked or that were not present in earlier interviews.

Findings

My findings are divided into three sections. First I discuss the advantages and disadvantages of leader-second dyads compared to having a single leader. The primary benefits accrue from increased specialization of the parties and the primary drawbacks relate to the need for constant coordination. Next, I discuss the two basic strategies that leaders and seconds use to share the leadership role. Both strategies are attempts to maximize the benefits of specialization while reducing coordination costs. A horizontal role differentiation strategy takes advantage of existing differences in personality or expertise, while a vertical role differentiation strategy requires the dyad to maintain clear hierarchical differences between them. Finally, in the last section, I discuss the perceived effectiveness of dyads using each of these strategies.

Advantages and Disadvantages of Leader-Second Dyads. One of the goals of my qualitative investigation was to understand how leader-second dyads differ from traditional scholarly views of leadership. Insights into the unique aspects of this dyad emerged from participant's discussions of its advantages and disadvantages. Although leaders and seconds sometimes emphasized different aspects of working in the dyad, there was widespread agreement that this form of leadership generates its own distinct benefits and challenges. I review the most prominent of these below.

A common theme among both leaders and seconds was that the dyad could be more than the sum of its parts. Both parties claimed they could accomplish more working together than either could alone. As one leader [PAS2] put it, "The benefit of a church this size is that you can afford to have a [second]. You know, someone to share the burden. My first church was small, but I kinda had to do it all myself. Here there is more to do, but with [my second] here I can handle a lot more." Neither leaders nor seconds attributed their ability to accomplish more to the fact that the dyad puts in more hours than either party alone. Instead, both parties claimed that

the benefits of working in a leader-second dyad were derived primarily from their ability to divide the leadership role between two people. For example, leaders claimed that being able to delegate some of their leadership responsibilities helped them capitalize on their strengths and focus their limited attention where it would be most impactful. This was best explained by the leader [ATT1] of a small non-profit focused on advancing minority rights. According to her, having a second

> *lets me focus on the parts of the mission where I add the most value. I could hire a bunch of assistants, but I'd have to spend all this time managing them. [OM1] takes care of all of that. I don't have to spend all this time telling everyone what to do. With her I can focus on the things I want to do, the things I'm better at.*

Seconds, on the other hand, felt that being number two relieved them of some of the political pressures of leadership which could boost their effectiveness. An assistant head coach [AC5] speaking about the politics at his university, said

> *So, there's a little bit more, and I dunno if a little bit, there's probably a lot more, weight on the shoulders of a number one versus a number two from that perspective. Not that you think any differently about the way that you are making the decisions or your input into them. But you do know that the buck isn't going to rest on your shoulders unless you really screw up…that's the stuff that is taken off your plate a little bit even though you know about it and you're trying to help direct that when asked what should we, what do you think we should do here or what's important or that kind of thing. You still, that's still not, yeah. Not yours.*

He went on to explain that he felt he was better able coach to his players as an assistant than he was as a head coach at a prior school. He attributed this to the fact that he spent less time managing various stakeholders.

Seconds also said that they benefited from having less attention focused on them, which allowed them to be less constrained in their actions. As one associate pastor [AR1] explained the

leader is “in charge of everything and he has to keep all those people happy. I can take a lot of risks and do a lot of things that are going to have a long term payoff. I can push people.” As the center of attention, the head pastor was expected to guide the church down a safe path, but the associate pastor felt he had much more freedom to make changes and challenge the traditional ways of doing things. A Provost [P1] provided a similar view when he explained that “as the number two person, you're actually a little bit more free because the number one has to be the steadying hand. I can be a little more provocative.”

Sharing the leadership role was also at the root of the primary drawback of leader-second dyads, increased coordination costs. To avoid unintentionally undermining each other and ensure that each party had all of the information they need, leaders and seconds sometimes had to stay in near-constant communication. For example, the Provost [P1] referenced above said that he spoke to the President of the university 15 to 20 times a day, even when they were not in the same city. Similarly, an Assistant Fire Chief [FC1] said he spent twice as much time talking to the Chief as he did talking to the people below him. Leaders and seconds also had to dedicate a significant portion of their mental capacity to each other. A company Vice President [VP2] explained how problematic this could be:

> *That’s the other thing, the burden I get of 50 percent of my own thoughts and the other 50 percent I have to think about what he's thinking about. Like all the time, especially when I'm at work. But even when I'm not I have to think, what would they be thinking about. That obsession with your boss can be maddening.*

In some cases, the challenges of working in a dyad could lead one party, typically the leader, to monopolize the leadership role. When this occurred the other party became little more than overhead and the dyad was less effective than an individual leader would be working alone (Hambrick & Cannella, 2004). An example of this was given by an associate rector [AR2]

describing his leader: “I would say she was over functioning as a leader, rather than delegating. There was very little delegating, even to me. So I basically did nothing for my first year” He went on to describe a situation in which he was supposed to manage a weekly church lunch for new members:

> *It was like everything I planned got chopped. ‘No, we're not doing that.’ And then she took over the actual lunch. I thought I was supposed to facilitate it and I had a whole plan. We were gonna play a little game first, mixer and stuff. Anyway, it was an example of ‘well I got to stop having ideas.’ No more ideas. So I just stopped having ideas. I did my job, I showed up. I did what I needed to do. It was really demoralizing because I felt like I was competent as a leader but I was never trusted.*

In this dyad, the leader took over entirely and the second was essentially not allowed to add value to the organization.

Strategies for Sharing Leadership. For the advantages of the leader-second dyad to be maximized and the disadvantages minimized there needs to be relatively little overlap in the roles played by the leader and the second. This is because clearly assigning different aspects of leadership to different parties helps reduce the amount of coordination that is needed which increases effectiveness (Denis et al., 2012; Gronn, 2002). Seconds were especially attuned to this need to establish their own areas of responsibility, separate from those of the leader. A military commanding officer [COF2] who had prior experience as an executive officer explained the issue this way:

> *One of the unique challenges of a number two is that: how do you lead your leaders? And you can say a bunch of cliché things, but I think the big thing is that you've got to find that maneuver space your boss is going to be comfortable with and then you need to drive up the number of successes within that realm…That’s how you make a contribution.*

When seconds were not given their own space to operate, the dyad was described as ceasing to be effective. As the aforementioned associate rector [AR2] put it, “if you aren’t giving me responsibility, why am I even here?”

All of the leader-second dyads I gathered data from utilized one of two strategies for dividing the work and sharing leadership of the group or organization: horizontal or vertical role differentiation.

Horizontal role differentiation involved each party taking primary responsibility for leadership in different topical domains or for different sets of leadership tasks. An example of this approach was described by an assistant head coach [AC4]:

> *We’re both involved, kind of with everybody, but I have a specific group that I'm coaching, which is the sprinters. I'm also the person that spearheads the recruiting. So, [I do] all of the research into the people that we're going after. And then at that point, we go through and figure out who she's going to contact, who I'm going to contact and we go through that.*

This is an example of dividing leadership by functional area. This was the approach that was used by leaders and seconds that viewed themselves as having significantly different areas of expertise. Another example of this type of differentiation was described by the co-founder and COO (CO2) of a startup that provides online reputation management services. This COO had a strong background in the technical aspects of search engine optimization and social media marketing, while the CEO had experience in traditional marketing and political consulting. The differences in their expertise led the pair to take on leadership in different functional areas. The COO concentrated on the technical and operational aspects of the business, while the CEO focused on building outside relationships and managing the company’s strategic direction. In

every case where functional horizontal differentiation occurred, it was accompanied by differences in education or prior work experience (i.e. different areas of expertise).

The other type of horizontal role differentiation I observed involved dividing up aspects of the leadership role itself. For example, one former executive officer in the military [XO2] explained the roles of leader and second as follows:

> *I'm trying to figure out the best way to explain the differences that I've seen. I think a lot of it depends on the Commander. I've had Commanders that are very stern: 'it's my way or the highway' type of deal. I've also had Commanders that wanted to be involved and talk to the soldiers at a lower level. So, depending on what their personality is, usually the XO, I've always seen, will take on the opposite personality when you have a good command structure. Because, sometimes you need a disciplinarian to say, 'Hey this is the way, you drive things home.' Sometimes you need, like I said, the peacemaker or the disciplinarian.*

In this example, according to the XO, military leaders working alone need to be both peacemakers and disciplinarians. However, in leader-second dyads, where the leadership role is divided between two people, these competing personas can be assigned to different parties. This approach to sharing leadership was used by dyads that saw themselves as having dissimilar psychological traits, such as different personalities or needs. For instance, an assistant coach's [AC2] description of the differences between his role and the role of the head coach suggested that he was more focused on the task needs of the team members, while the head coach focused on the socio-emotional needs. When describing these differences, he appeared to identify underlying differences in their levels of conscientiousness and extraversion:

> *I think we're different in that I think we believe in the same stuff and maybe have the same philosophies about things or very similar at least. But like I tend to be in here, in the details and little things, whether it's on the court or recruiting or anything like that. I'm more in the details…And in comparison, he's I think more comfortable, talking to the*

> *players, you know, helping them with whatever is going on…He just more outgoing, I think for him it is easier to relate to the players.*

The head coach [HCO1] agreed that differences in their personalities helped them be more effective: "Our personalities are very different, but it's not a conflict. It's not a bad thing. I think it actually helps us." Other seconds also expounded on the benefits of having complementary personalities and how it led to complementary roles. For example, an assistant principal [AP2] said: "I do think that my personality being what it is, you know more reverent, more based on relationships, that for me, I was fortunate to have a boss who didn't mind being somewhat of a taskmaster." Intriguingly, although both leaders and seconds were able to identify differences in personality, seconds tended to identify more of them.

In horizontally differentiated dyads, the leader and second typically had similar levels of status and power within the group or organization. In some cases, the pair acted more like co-leaders than a leader-second dyad. This was evident in the above assistant coach's [AC2] description his relationship with his head coach:

> *I think that in my role, there's more of an equal relationship, between the one and the two. Cause there are some coaches out there that are number ones that I could never work for because they would, it would be more of a demeaning kind of, not symbiotic thing where I enjoyed the process and also felt like, didn't really feel like I was the second, even though I clearly know that I am. It's just nice to know that your opinion is valued at, at an equal level here.*

In other words, not only did horizontally differentiated dyads not engage in vertical differentiation, they actively worked to minimize status differences between them. However, as several seconds noted, even though they enjoyed similar levels of status and power within the group, outsiders sometimes still perceive significant status differences between the two.

Vertical role differentiation resembled a more traditional leader-follower relationship. This was the approach that emerged when leaders saw their seconds as substantially similar to themselves, regardless of how the second saw the dyad. In these dyads, the leader retained oversight of all functional areas and embodied all aspects of the leadership role. One assistant manager provided an example of this type of differentiation:

> *So she puts me in a position of authority, and then if we make a decision, and I let her know after the fact, she goes, 'you did that without consulting me.' So instead, I have to say, 'Oh, you know, we had this great idea. We really hope that you like it.' You know? I have to be very careful in how I word things so she feels like she's involved and making the calls.*

Typically, the purpose of the second in these dyads was to provide the leader with information and implement the leader's decisions. As an executive officer [XO5] explained:

> *You need to be, I hate to say, you've got to be the Mrs. Kravitz of the world. You need to know what all the gossip is going on. You need to have your hands in everything, kind of be out there, knowing, because sometimes situations brew and you need to give your boss a heads up, or sometimes they come to you and say 'so I'm hearing this rumor, tell me what's going on' … So I think that's the biggest thing is understanding everything that is going on and being able to say, 'Sir, here's the issue.; But then also tell him, 'Hey, this is the way forward, this is also how we will still meet your intent and your vision on going forward.'*

In this case, the XO was expected to have a firm grasp on all of the information that might be relevant to the leader and to successfully implement the leader's vision.

In vertically differentiated dyads, seconds were also expected to be surrogates for the leaders, acting on their behalf and usually leading in the same manner as they would. A Vice Chair [VC1] of a small community organization gave an account of this when she said: "my only real responsibility as Vice Chair is to lead when the Chair is not present." Seconds in vertically

differentiated dyads also had, by definition, noticeably less power and status than the leader. This was also expressed by the Vice Chair when she said: “even outside of our roles as Chair and Vice Chair, she has more power and influence than I do.” As a result of these status and power differences, seconds often formed closer relationships with followers than with their leaders.

The main advantage of vertical role differentiation was that it helped minimize status conflict and provided unity of command. For example, an assistant manager [AM3] in a craft brewery tap room was experiencing problems with a new manager who, unlike her previous manager, had a similar background as her own. Initially, there was conflict between the two and confusion among the taproom staff, who found that rules could suddenly change depending on who was managing the taproom that day. After the new manager established more vertical role differentiation these issues began to subside. However, it is worth noting that this dyad never enjoyed the same success as the previous dyad in which the manager and assistant manager had different areas of expertise and relied on horizontal differentiation.

The two role differentiation strategies were, for the most part, mutually exclusive. I found only one instance in which a vertically differentiated dyad also attempted some limited horizontal differentiation, and this occurred only because the organization’s rules mandated that the responsibility for a particular area lay with the second.

Leader-Second Effectiveness. A final goal of my qualitative investigation was to identify some of the properties of the dyad that influence its effectiveness. Effectiveness in leadership research generally refers to the extent to which a leader influences and guides the activities of his or her group toward the achievement of its goals (Judge et al., 2002). Therefore, I conceptualized leader-second effectiveness as the extent to which the dyad influences the broader group and

helps it achieve its goals. Because a leader and second must work together to avoid undermining each other, I considered the quality of the leader-second relationship as an indicator of the dyad's effectiveness. I also looked for descriptions of group and follower successes and failures, instances of effective and ineffective change efforts, and decision-making processes and outcomes.

Leaders and seconds that engaged in horizontal role differentiation almost universally described their dyads as highly effective, suggesting that, at least from the perspective of the dyad members, this was the best strategy. However, it is worth noting that I do not have the perspective of followers, who may find this type of leadership structure more confusing or difficult to navigate than vertical differentiation where the chain of command is clear. In my sample, this was the type of differentiation that emerged whenever both the leader and the second recognized that they had underlying differences in personality or expertise. It seems that when the parties did not have complementary personalities or backgrounds, this type of differentiation was not viable. Take, for example, the dilemma faced by one executive officer [XO3]:

> *I've had this happen to me, about two years ago, where my boss came to me and said, 'Hey, I need you to be the hammer on a lot of these topics. They're not getting done the way I want them to get done.' But he also didn't want to look like the bad guy in a lot of situations, he needed somebody to be that for him…but I'm not a hammer guy. So I went to him and said 'What do you want me to focus on?' I don't want to be a raging a-hole all the time. I need to be friendly enough to where people bring me problems as the XO, so it doesn't come to your level. But I also said, 'hey, what are the areas that you see that really need me to clean up? And I'll get that done'*

The lack of complementary personalities meant that the leader's attempts at horizontal role differentiation failed. Instead, the second asked for vertical differentiation, in which the leader set a goal and then delegated authority to the second to achieve that goal as he saw fit.

Vertical differentiation emerged whenever the leader saw the second as not possessing beneficial complementarity. The results for vertical differentiation were more mixed. Some dyads employing this strategy described themselves as reasonably effective, but they did not display the same enthusiasm as dyads engaged in horizontal differentiation. For example, they frequently described their relationship as good but not as particularly close, unlike horizontally differentiated dyads who tended to have deeper or stronger relationships. Seconds in vertically differentiated dyads were also more likely to discuss their dissatisfaction with some of the leader's decisions, even if they were given the opportunity to provide input into the decision. Some vertically differentiated dyads went so far as to describe themselves as highly ineffective. This was especially likely in dyads where the second saw themselves as dissimilar to the leader. For example, an assistant store manager in a vertically differentiated dyad [AM4] described his manager as "power hungry" and a "dictator" and said that they could not work together effectively because they were "totally different people."

Discussion

The findings from my qualitative investigation suggest that at least three major conclusions can be drawn about leader-second dyads. First, the most effective dyads tended to have complementary traits, particularly personality and expertise. This was demonstrated by the dyads who, drawing on their underlying differences, engaged in horizontal role differentiation and then went on to described themselves as highly effective. Second, these more effective dyads capitalized on their complementary traits by minimizing the amount of status distance between

them. This was demonstrated in the tendency of the horizontally differentiated dyads to describe themselves as actively minimizing any differences in status and power. These first two findings are the basis for my focus in the next section on personality similarity, expertise similarity, and status distance. Finally, leaders seem to have significant control over the type of role differentiation that occurs. This was demonstrated by the dyads that became vertically differentiation even when the second believed that they had complementary traits that the leader should be taking advantage of.

CHAPTER 4: THEORY DEVELOPMENT

In this chapter, I build on the findings from my qualitative investigation and on prior empirical work to develop new theory about the links between leader-second dyad characteristics and their effectiveness. Although I engaged in some limited conceptualizing in the prior chapter, here I develop the specific hypotheses that constitute a more precise and falsifiable theory that I will be testing in my archival study. Although I provide hypotheses about mediating mechanisms, due to the limitations of my archival data I will only test main effects and interactions. I include these additional hypotheses so they can be tested in future investigations and because they help identify the micro-level processes that underlie the theory.

Before proceeding, it is necessary to briefly comment on the construct of leader-second effectiveness. The measurement of effectiveness in the leadership literature has been notoriously inconsistent (Yukl, 2010). It has been operationalized variously as group performance, follower attitudes and perceptions (of the leader), leader contributions to the quality of the group's processes, and leader career success (Yukl, 2010). These operationalizations are so varied that they go beyond a measurement issue, and create a conceptual issue, making it difficult for researchers reviewing the literature to separate effectiveness from related constructs such as leader emergence (e.g. Judge et al., 2002, 2009). Some authors have attempted to address these issues by distinguishing between different types of leader effectiveness (e.g. Judge et al, 2009), while others have argued that effectiveness should be conceptualized in only one way (e.g. Hogan, Curphy, & Hogan, 1994; Hogan & Kaiser, 2005). Both of these approaches argue that a narrower conceptualization of effectiveness is needed in most studies.

To avoid the conceptual issues associated with the broadness of the leader effectiveness construct I use *collective performance* as my dependent construct. By focusing on this operationalization of leader-second effectiveness, I create a stronger set of predictions and a more robust and falsifiable theory. I chose to concentrate on collective performance because it is what Judge et al. (2009) classified as objective leader effectiveness, which is more easily distinguished from leader emergence than subjective effectiveness (Hogan et al., 1994; Hogan & Kaiser, 2005). Concentrating on collective performance also allows me to draw clearer connections between my theory and related literatures, such as leader-member exchange (LMX) and team diversity, where group (collective) performance is also the dependent construct.

Overview

A central theme that emerged in both my literature review and my qualitative investigation was the importance of complementarity (versus similarity) in both personality and expertise. No previously published research investigates complementarity in the context of leader-second dyads. For this reason, I combine the insights I garnered from my interview data and published research on the effects of similarity in other types of dyads and groups to derive a set of testable hypotheses. The prior scholarly work I draw from has investigated personality and expertise differences in leader-subordinate dyads, TMTs, and work groups in general. Although this literature provides insight into the links between similarity and collective performance, it might not always apply to leader-second dyads. The interpersonal dynamics in a leader-second dyad are likely to be different from traditional leader-subordinate dyads, teams, or work groups. For that reason, I also draw on my qualitative data to help identify the situation in which leader-second dyads are likely to be different from these other contexts.

Another construct that emerged in both my literature review and my interview data was *status distance*. Neither my interview data nor the prior literature indicates that there is likely to be a main effect of status distance on collective performance. As a result, I do not hypothesize any direct effects. However, I do offer some propositions about its moderating role.

Personality Differences

The results of my qualitative investigation suggested that leader-second differences in personality can create beneficial complementarities that help the dyad be more effective. However, the evidence from the existing literature on personality differences is mixed with regard to both the existence and direction of the relationship between it and collective performance. In the only such study I could identify in the TMT literature, Pitcher and Smith (2001) studied personality heterogeneity as part of their eight-year, qualitative field study of a large organization. They found that personality heterogeneity tended to increase innovation and performance. However, studies of LMX have found both positive and negative connections between dyadic personality differences and the quality of the relationship between a leader and a follower, the latter of which is linked to performance (Graen & Uhl-Bien, 1995; Martin et al., 2016). For example, Oren et al. (2012) found that, counter to their predictions, an index of overall personality difference was positively related to relationship quality. In contrast, Zhang, Wang, and Shi (2012) found that differences in proactive personality were negatively related to relationship quality. Bauer and Green (1996) also found a negative relationship between differences in positive affect and relationship quality. Bernerth et al. (2008) found a negative relationship for differences in some personality traits and no relationship for others. Finally, although work on team diversity is not directly related to leadership, researchers investigating personality diversity in teams have long debated the merits of similarity versus complementarity

(Neuman, Wagner, & Christiansen, 1999; Muchinsky & Monahan, 1987). Here too the findings are mixed. Some meta-analytic evidence finds no clear relationship between personality differences in teams and collective performance (Bell, 2007), while others find a positive relationship for some traits and no relationship for others (Peeters et al, 2006).

A likely explanation for these mixed results is that not all differences in personality create useful complementarity. Whether or not a difference in personality is beneficial depends on both the specific personality trait being examined and the context in which it is examined (Bell, 2007; Moynihan & Peterson, 2001). The effects of overall personality difference have been found to obscure differential effects of complementarities on specific personality traits (Moynihan & Peterson, 2001; Neuman et al., 1999). Measures of overall personality difference have generally been associated with higher collective performance (e.g. Aamodt & Kimbrough, 1982; Hoffman, 1959; Hoffman & Maier, 1961; Lampkin, 1972). However, examining specific traits reveals a more complex set of positive and negative relationships (e.g. Barry & Stewart, 1997; Neuman et al., 1999). For this reason, rather than focusing on personality differences as a whole, I focus on the differences in each of the "Big Five" personality traits independently.

The other issue is that leader-second dyads are a unique context that is likely different from those examined in the LMX, TMT, and general teams literatures. In my qualitative data, I found that differences in personality traits are possibly associated with improvements in leader-second effectiveness because they help create horizontal role differentiation. For this to be true, *both* high and low levels of the trait must be associated with beneficial leadership behaviors. Therefore, when examining each of the big five traits I look for these relationships.

Extraversion. Extraversion is the personality dimension that is most closely related to interpersonal interactions and social relationships (McCrae & Costa, 1989). Because of this, differences in extraversion may be particularly likely to facilitate horizontal role differentiation. An example of the positive effect that differences in extraversion between a leader and second can have was conveyed by a startup COO [CO2] I interviewed. The COO described himself as introverted and the CEO as extraverted. Because of the difference in their personalities, the CEO concentrated on building relationships both inside and outside of the company, a task that the COO did not enjoy. The COO spent more time alone working on solving the technical and operational issues that arose in the organization. Another example comes from an assistant branch manager [AM1] at a bank. In this instance, the assistant branch manager was the more extraverted of the pair. As a result, she spent more time interacting with customers and tellers, while the branch manager focused on adherence to bank procedures and spent more time counting currency and filling out paperwork in "back office" functions. In both of these examples, if the members of the dyad were both high or low on extraversion, the pair would have lacked the beneficial complementarity that made them effective.

These two examples illustrate the dual roles that leaders must play. Leaders need to attend to both the socioemotional and task needs of their group (Bales 1950; Bales & Slater, 1955; Judge, Piccolo, & Ilies, 2004). However, few leaders have the ability to do both (Fiedler, 1964; Kerr et al, 1974). Having a complementary partner allows the leader-second dyad to provide both the relationship-oriented and task-oriented leadership that the group requires. Because extraversion overlaps with social leadership (Costa & McCrae, 1988) and emotional intelligence (Ciarrochi, Chan, & Caputi, 2000; Van der Zee, Thijs, & Schakel, 2002), the more extraverted member of the dyad can more easily focus on the group's socioemotional needs,

allowing the more introverted individual to focus on the task needs of the group. Differences in extraversion may also help leaders and seconds balance the competing needs to talk and listen. Extraversion is the trait that is most strongly linked to leader emergence and follower perceptions of effectiveness (Judge et al., 2002). This is because leaders are expected to be lively, energetic and outgoing (Lord et al., 2001). However, groups do not always perform better under extraverted leaders (Grant, Gino, & Hoffman, 2011). Extraverts can dominate conversations and having too many extraverts can lead to conflict (Barry & Stewart, 1997; Mohammed & Angell, 2003). More introverted leaders tend to be better at listening to followers and are more receptive to follower's proactive behavior (Grant et al, 2011). For these reasons, larger differences in extraversion between the leader and second will help collective performance because they allow the dyad to both talk and listen to followers at the same time.

There is some evidence from the teams research to support the argument that greater diversity in extraversion improves collective performance. Barry and Stewart (1997) found a curvilinear relationship between the proportion of extroverts on a team and group performance. They argued that extraverts and introverts serve complementary social roles on teams. Neuman et al. (1999) also found that diversity in extraversion had a positive effect on group performance. They argued that having too many extraverts led to competition for speaking time, while having too many introverts allowed a small subset to dominate the group's discussions. Mohammed and Angell (2003, 2004) found that extraversion diversity did not affect the amount of relationship conflict on the team, but did improve team performance. Although these studies examined teams, their arguments about the complementary social roles played by introverts and extraverts could apply to leader-second dyads.

In contrast to the findings above, Phillips and Bedeian (1994) found that perceived differences in extraversion were negatively related to perceptions of LMX. However, this countervailing finding may be explained by their use of perceptions rather than actual differences and the examination of dyadic rather than broad collective outcomes. Overall, my qualitative data and the weight of the evidence from the prior literature suggests there is a negative effect of extraversion similarity (positive effect of differences) on collective performance.

Hypothesis 1: The magnitude of the difference between a leader and second on extraversion is positively related to collective performance.

Openness to Experience. Individuals who are high on openness tend to be more willing to experiment and to try new things (LePine, 2003). They are also more risk-seeking, can more easily take on new perspectives, and are more creative (Barrick & Mount, 1991; Bernerth et al., 2009; McCrae, 1987). In my qualitative data, there was some evidence that differences in openness could be beneficial. An example of this comes from my interview with an assistant coach (AC1) who described himself as less open than his head coach. The pair was effective because the assistant coach worked on tweaking and perfecting existing strategies and techniques while the head coach often came up with new ideas and things to try. Had the dyad both been high on openness they may have become too enamored with exploring novel approaches. On the other hand, if they were both low in openness they may not have changed their approach often enough to be competitive.

The reason that differences in openness are likely to benefit leader-second dyads is that it can help the dyad cope with an essential tension that is present in all organizations. The need to balance competing demands for continuity (exploitation) and change (exploration), or as it is

often called, the need to promote ambidexterity, is something that all leaders face (Gibson & Birkinshaw, 2004). Although this tension is often studied at the organizational level, it must be managed at the level of individual leaders (Gibson & Birkinshaw, 2004; Jansen et al., 2008). One of the ways that leaders could manage this tension is by partnering with a second that differs from them in their level of openness to experience (c.f. Hunter, Cushenbery, Jayne, 2017). Because individuals who are high on openness are more risk-seeking and more willing to experiment, they are likely to be better at identifying new opportunities and promoting needed change (exploring). On the other hand, individuals who are low on openness are likely to work to maintain continuity in their unit and preserve processes that have been shown to be effective (exploiting).

Compared to extraversion, there is very little research examining differences in openness to experience. In the LMX literature, Bernerth et al. (2009) found that differences in openness were negatively related to perceptions. However, in team settings, two meta-analyses have found no significant relationship between differences in openness and group performance (Bell, 2007; Peeters et al, 2006). Despite the evidence pointing to either a negative or a non-significant relationship between openness and performance in other settings, I hypothesize that differences in this trait will be beneficial in leader-second dyads. This is because of the paradoxical need in the broader organization or collective for both continuity and change, a demand that is ultimately placed on those in leadership roles.

Hypothesis 2: The magnitude of the difference between a leader and second on openness is positively related to collective performance.

Agreeableness. Like extraversion, agreeableness is a trait that is strongly associated with interpersonal interactions and social relationships (McCrae & Costa, 1989). This personality dimension describes the extent to which people are tolerant and trusting, and it has been associated with social conformity and cooperativeness (Barrick & Mount, 1991). In my qualitative data, differences in agreeableness led to horizontal differentiation in which the leader and second took on the roles of disciplinarian and peacemaker. This was particularly apparent in military dyads. For example, one XO [XO4] who described differences in levels of agreeableness also said that his role was to be the "hammer" that instilled discipline and held the crew accountable, while the CO was a friendlier, softer figure to the crew. In contrast, another XO [XO3], who described both himself and his CO as agreeable and friendly, struggled to be the unit's disciplinarian. Instead, this XO found that he was more effective when he was paired with a CO who could be the stern disciplinarian while he was friendlier with the crew. In both examples, dyads were characterized as being more effective when their levels of agreeableness were different. In other words, differences in levels of agreeableness allowed these leaders and seconds to take a "good cop-bad cop" approach to managing their units.

There is some evidence to suggest that both high and low levels of leader agreeableness can be beneficial. Meta-analytic findings show that leader agreeableness has a weak but positive relationship with effectiveness (Judge et al., 2002). This is likely because agreeableness promotes cooperation and interpersonal sensitivity, both of which facilitate collective performance (Bass & Stogdill, 1990; Zaccaro et al., 1991). Agreeableness may also help leaders improve collective performance by promoting group cohesion and facilitating the formation of social alliances (Bell, 2007; Kamdar & Dyne, 2007; Mount, Barrick, & Stewart, 1998; Neuman et al., 1999; Peeters et al, 2006; Van Vianen & De Dreu, 2001). In short, agreeableness promotes

helpful “good-cop” leader behaviors. However, high levels of agreeableness can also be problematic for leaders. Meta-analytic data shows that agreeableness has a negative relationship with leader emergence and it is associated with a higher need for affiliation, which makes leaders less effective (Judge et al., 2002; Piedmont, McCrae, & Costa, 1991; Yukl, 2010). Agreeableness can also harm group performance by promoting false consensus and minimizing beneficial task conflict (Cosier & Schwenk, 1990; Jehn & Mannix, 2001; Schwenk & Cosier, 1980). These relationships suggest that low levels of agreeableness can provide a benefit to leaders because it makes it easier for them to engage in unpleasant but necessary behaviors, (i.e. be the “bad cop”). Taken together the evidence suggests that there are benefits to having leaders that are both high and low in agreeableness. Therefore, in leader-second dyads, differences in levels of agreeableness may improve collective performance by allowing the pair to reap both sets of benefits. For example, while one member of the dyad focuses on facilitating group cohesion and forming relationships with stakeholders, the other challenges the group’s thinking and provides needed discipline.

Differences in agreeableness have not been as widely studied as differences in extraversion, however, they have been the focus of some LMX and teams research. In contrast to my qualitative data, the evidence from these literatures mostly points to a negative effect of differences in agreeableness on collective performance. For example, Mohammed and Angell (2003) found that higher variance in team agreeableness had a negative impact on performance. Bernerth et al. (2009) found that differences in agreeableness were negatively related to perceptions of LMX. The meta-analytic evidence on teams is mixed, with one study finding a negative relationship and another finding no relationship (Bell, 2007; Peeters et al, 2006). The reason for these mostly negative relationships may be that differences in levels of agreeableness

are more problematic in teams and traditional supervisor-subordinate relationships than in leader-second dyads. These differences can make social relationships more difficult to maintain in these contexts (Kamdar & Dyne, 2007; Mount et al., 1998; Neuman et al., 1999). However, in leader-second dyads, any challenges to their relationship that are created by differing levels of agreeableness are likely to be outweighed by the benefits of having two individuals with complementary dispositions in these leadership roles. For this reason, I hypothesize the following:

Hypothesis 3: The magnitude of the difference between a leader and second on agreeableness is positively related to collective performance.

Conscientiousness. Highly conscientious people are responsible, organized, hard-working, and achievement-oriented (McCrae & Costa, 1989). After extraversion, this is the personality trait that is most strongly linked with leader effectiveness (Judge et al., 2002). Highly conscientious individuals tend to become effective leaders because they have more initiative and persistence (Goldberg, 1990), which are essential aspects of leadership (Kirkpatrick and Locke, 1991). However, unlike extraversion, there is no evidence that the benefits of leader conscientiousness can be reversed in some circumstances. This is likely because it is the personality trait that is most strongly linked to job performance in general (Barrick & Mount, 1991). Low levels of conscientiousness are associated with social loafing and free riding (Barry & Stewart, 1997), behaviors which may be particularly problematic in dyads that share leadership responsibilities. If one member is low in conscientiousness it increases the likelihood that the other member of the dyad will carry the burden of leadership, making the second person redundant and a drain on resources. However, if both members of the dyad are low in conscientiousness the dyad may be completely ineffective because of the poor performance of

both members. In other words, similarity in conscientiousness is only beneficial if both individuals are high (but not low) on conscientiousness. Because there is no apparent benefit to having a leader low in conscientiousness, once the mean level of conscientiousness is accounted for, there should be no effect for leader-second differences in conscientiousness on collective performance. However, the overall level of conscientiousness in the dyad is likely to have a positive impact.

In the published literature, investigations of conscientiousness differences in team and dyads have found little evidence of a relationship with collective performance. For example, Barry and Stewart (1997) found no relationship between the proportion of highly conscientiousness team members and team performance. Similarly, Harrison et al. (2002) found no significant effects for team conscientiousness diversity, and Mohammed and Angell (2003) found variance in team conscientiousness was unrelated to performance, as did Neuman et al. (1999). The meta-analytic evidence in team settings is mixed with one accumulation showing no effect (Bell, 2007) and another finding that it has a negative impact (Peeters et al., 2006). However, the latter finding may be the result of lower *average* levels of conscientiousness in teams with more variability. This is supported by the fact that both meta-analyses found that average levels of conscientiousness in teams have a negative impact on performance. Overall, the evidence is consistent with the view that differences in leader-second conscientiousness are not associated with collective performance but that the elevation or overall level of conscientiousness in the dyad is.

Hypothesis 4: The level of conscientiousness in a leader-second dyad is positively related to collective performance.

Neuroticism. Individuals who are high in neuroticism are characterized by embarrassment, insecurity, worry, and anxiousness (Barrick & Mount, 1991). As with conscientiousness, there appears to be little benefit to having leaders that are on one side of the neuroticism spectrum. Neuroticism is negatively linked to leader emergence and effectiveness (Judge et al., 2002). This is because highly neurotic individuals experience more negative affect (McCrae & Costa, 1991), which can lead to motivational deficits that undermine the initiative and persistence that are essential to leadership (Peterson & Seligman, 1984). Neuroticism is also linked to worse overall job performance (Judge & Bono, 2001; Tett, Jackson, & Rothstein, 1991), suggesting that highly neurotic individuals will be less effective as leaders and seconds.

I found no discussions of neuroticism in my qualitative data. In the broader literature, neuroticism was the least studied of the Big Five personality traits. In the team diversity literature, both meta-analyses found no relationship between variability in neuroticism and team performance (Bell, 2007; Peeters et al., 2006). However, unlike conscientiousness, they also found no significant effect of overall levels of neuroticism on performance. Despite the lack of evidence for an effect of team level neuroticism, I hypothesize a negative effect for the level of neuroticism in leader-second dyads because of its links to leadership effectiveness and job performance.

Hypothesis 5: The level of neuroticism in a leader-second dyad is negatively related to collective performance.

Expertise Similarity

Another type of difference that arose in my interviews as a source of horizontal role differentiation was related to expertise (knowledge, skills, and abilities). In cases where leaders

and seconds had the same areas of expertise, conflict frequently emerged over how best to lead the group in these areas. On the other hand, when the pair had expertise in different areas, they were more likely to learn from each other and share leadership of the group by taking on specialized non-overlapping roles. These findings suggest that diversity of expertise in leader-second dyads promotes cooperation and encourages the pair to adopt the distinct but complementary roles that have been linked to improved collective performance in situations where leadership responsibility is shared by more than one individual (Gronn, 2002; Denis, et al., 2012).

Although I was unable to identify any studies of expertise similarity in dyads, I did find widespread support for the benefits of expertise diversity in groups. Meta-analytic evidence finds that TMT functional background heterogeneity has a positive impact on firm performance (Certo et al., 2006). There is also meta-analytic evidence to support a positive relationship between both functional and educational background diversity in teams and collective performance (Bell et al., 2011). A few studies have suggested that the relationship between expertise diversity and collective performance could be curvilinear (e.g. Dahlin, Weingart, & Hinds, 2005; Van Der Vegt & Bunderson, 2005). These authors argue that at extremely high levels of expertise diversity the team suffers from an inability to coordinate and share information. However, this is unlikely to occur in leader-second dyads because there are fewer individuals involved. In addition, expertise diversity may be particularly important for people in shared leadership roles. Researchers have argued that the benefits of sharing leadership responsibility are primarily derived from the ability to utilize each person's unique knowledge and skills (Friedrich et al., 2009).

Taken together, both my qualitative data and the research on expertise diversity in groups provide support for a hypothesized positive relationship between expertise differences (negative effect of expertise similarity) and collective performance.

Hypothesis 6: Differences between leaders and seconds in their areas of expertise are positively related to collective performance.

Mediating and Moderating Mechanisms

Status Distance. Traditional approaches to status hierarchies have focused on the rank-ordering of individuals (Magee & Galinsky, 2008). This work has examined the coordination benefits of hierarchical differentiation and how changes in relative positions in the status hierarchy can affect performance (e.g. Groysberg, Polzer, & Elfenbein, 2011; Halevy, Chou, & Galinsky, 2011; Knight & Mehta, 2017; Marr & Thau, 2014). This view of status as a rank order is embedded in much of the leadership literature, which typically differentiates leaders and followers by their relative standing in a formal hierarchy (e.g. Graen & Uhl-Bien, 1995). It is also inherent in the definition of leaders and seconds. However, this does not mean that status differences do not play an important role in leader-second dyads. The view of status difference in only rank-order terms obscures the impact that the magnitude of the status difference between members of the dyad can have. This is problematic because an emerging literature on status distance has shown that it can have a significant influence on interpersonal interactions and performance (e.g., Doyle, Lount, Wilk, & Pettit, 2016; Pitcher & Smith, 2001).

In the context of leader-second dyads, status distance is likely to moderate the effects of personality difference on collective performance. When personality differences are combined with higher status distances some of the benefits of having complementary dispositions can be

lost (Bunderson & Van der Vegt, 2017). This might be why nearly all of the dissimilar dyads in my qualitative data also exhibited little status distance between them.

Increasing hierarchical distance could also decrease the benefits of expertise complementarity in leader-second dyads. In my interviews, the seconds who were in dyads with high status distance reported having few interactions with their leader and little input into decisions. This may mean that in these dyads individuals exchange less information and that the leader is less likely to utilize the second's expertise, which reduces its unique benefits (Bunderson, 2003; Dahlin et al., 2005; Phillips, Rothbard, & Dumas, 2009).

Relatively few studies have examined the status distance between leaders and other group members. However, there is some evidence that differences in power and status can moderate the effects of other types of differences on collective performance in teams (Bunderson & Van der Vegt, 2017). In one of the first studies of TMT power, Finkelstein (1992) found that functional background diversity (i.e. expertise dissimilarity) did not have an impact on the firm unless the power of each of the TMT members was accounted for. Pitcher and Smith (2001) similarly found that the cognitive diversity of the TMT impacted firm outcomes only after accounting for TMT member's power. Hambrick, Humphrey, and Gupta (2015) found that the degree of vertical differentiation in a TMT moderated the positive relationships between firm performance and both TMT demographic and tenure heterogeneity, such that lower vertical differentiation strengthened those relationships. Finally, in their study of TMT politics, Eisenhardt and Bourgeois (1988) found that stable political alliances formed around demographic similarities only when power was highly centralized in the CEO. Taken together, these studies support the contention that the effects of both types of leader-second similarity are likely to be moderated by hierarchical distance, and that lower status distance should strengthen these relationships.

Hypothesis 7: The positive relationship between leader-second personality differences and collective performance is moderated by status distance such that lower distance strengthens the relationship.

Hypothesis 8: The positive relationship between leader-second expertise differences and collective performance is moderated by status distance such that lower distance strengthens the relationship.

I do not hypothesize a main effect for status distance because it has been shown to have both positive and negative effects (Bunderson et al., 2016). Prior research has found that when two group members have similar levels of status they are more likely to experience conflict between them, as well as being less likely to help each other (Bunderson, van der Vegt, Cantimur, & Rink, 2016; Doyle, Lount, Wilk, & Pettit, 2016). However, large differences in status have also been shown to discourage interactions and information exchange between people (Bunderson, 2003; Phillips et al., 2009). In co-CEOs, both very large and very small differences in status have been shown to decrease performance, implying that the relationship between status distance and performance may be curvilinear (Krause et al., 2015). What these findings suggest is that there is not a simple main effect of status distance on collective performance.

Paradoxical Leadership Behaviors. In discussing the benefits of differences in extraversion, agreeableness, and openness in leader-second dyads, I have identified a number of beneficial leadership behaviors that appear to be in opposition to one another (e.g. talking vs listening, peace-making vs punishing, and exploration vs exploitation). Evidence from theories of leader behavioral complexity and paradoxical leadership suggests that the need for such

seemingly incompatible leadership behaviors is widespread (Denison et al., 1995; Zhang et al., 2015). According to these theories, conflicting demands in organizations require leaders to engage in a variety of simultaneously inconsistent behaviors, and leaders who display more inconsistent behavior are rated as better performing (Denison et al., 1995; Zhang et al., 2015). However, there is also a danger that leaders can appear inconsistent to followers, which harms follower's trust in them and degrades performance (Simons, 2002; Simons et al., 2015). A potential advantage of leader-second dyads is that, together, they can engage in high levels of paradoxical leadership behaviors while minimizing the risk of appearing inconsistent. This is because they can divide up the behaviors in such a way that each member of the dyad appears to be highly consistent. As I have discussed both in the findings from my qualitative investigation and in the sections above, this is particularly likely to occur when there are differences in personality between leaders and seconds. For this reason, I hypothesize that differences in extraversion, agreeableness, and openness tend to create higher levels of dyadic paradoxical leadership behaviors, which in turn leads to better collective performance. Zhang et al. (2015: 539) define the construct of paradoxical leadership behavior as "leader behaviors that are seemingly competing, yet interrelated, to meet competing workplace demands simultaneously and over time." I am expanding on this notion of paradoxical behaviors by applying it to leader behavior at a dyadic level.

Hypothesis 9: The relationships between collective performance and differences in extraversion, agreeableness, and openness are mediated by dyadic paradoxical leadership behaviors.

Information Elaboration. Scholars examining team diversity have long argued that the benefits of heterogeneity are derived largely from an increase in the elaboration and processing

of information (van Knippenberg, De Dreu, & Homan, 2004). Information elaboration is the "exchange of information and perspectives, the process of feeding back the results of this individual-level processing into the group, and discussion and integration of its implications" (van Knippenberg et al., 2004: 1011). When leaders and seconds have different areas of expertise there is more information elaboration in the leader-second dyad and in the unit they lead. This occurs in part because of the increased opportunity for information elaboration that results from variation in deep-level characteristics, which creates more unique and varied perspectives (Harrison, Price, & Bell, 1998; Phillips & Loyd, 2006; van Knippenberg et al., 2004). Differences in leader-second expertise also increase information elaboration because easily identifiable differences such as these increases each individual's awareness that they have unique information to offer and makes them more likely to share that information (Phillips & Loyd, 2006 Phillips; Northcraft, & Neale, 2006). Greater information elaboration in the dyad should result in improved decision-making and increased collective performance, just as it does in teams (Larson et al., 1998; Stasser & Titus, 1985).

In addition to improving information elaboration in the dyad, differences in leader-second expertise may also improve information elaboration in the rest of the group. This is because leaders act as role models for their followers, modeling the behavior that followers should imitate (Avolio & Gardner, 2005; Bass & Stogdill, 1990). In addition, groups with leaders and seconds who are different tend to recognize and value differences more, which has been shown to increase information elaboration (Homan et al., 2007). Higher levels of information elaboration in groups have been shown to benefit collective performance (Homan et al., 2007; Mesmer-Magnus & DeChurch, 2009; Stasser & Titus, 1985).

Hypothesis 10: The relationship between collective performance and differences in expertise is mediated by information elaboration in the dyad and in the group.

Discussion

An overall model of hypotheses 1 through 8 showing the links between the traits of the leader-second dyad and collective performance, as well as the moderating role of status distance, is depicted in Figure 1. In the next chapter, I will present a design for an archival study that will test these hypotheses. I do not include hypotheses 9 and 10 in the figure because they will not be tested in this dissertation.

CHAPTER 5: STUDY DESIGN

One of the challenges of studying leader-second dyads is finding a large enough sample for empirical investigation and hypothesis testing. Few organizations have a sufficient number of formally designated seconds to conduct an adequately powered field study within a single firm. For that reason, I chose to examine leader-second dyads across multiple organizations. The most practical way to collect the necessary data from such a large number of organizations is to use existing data archives. To this end, I undertook an exhaustive search for archival data sets that would meet three requirements: (a) a clearly identifiable leader and second, (b) a measure of collective performance, and (c) a way to measure status distance and differences in expertise and personality similarity. Unfortunately, direct measures of traits, such as status, personality, and expertise are rarely available in archival data sets. However, it is often possible to obtain indirect measures (e.g. Chatterjee & Hambrick, 2007; Schwartz et al. 2009).

I compared a large number of data sources against my three criteria. I considered data from legislators, sports teams, restaurants, schools, religious organizations, tv and movie productions, and so on, but most did not meet one or more of the necessary conditions. After an exhaustive search, I found that the most viable archival data for a study of leader-second dyads comes from the CEOs and COOs of large public companies. In this context, the leader and second are clearly identifiable, information about firm performance is widely available, and there is ample material about individuals that can be used to develop indirect measures (e.g. public statements and background information). Therefore, I chose to examine the effects of personality and expertise differences on collective performance, as well as the moderating effect of status distance, in a sample of archival data on the CEOs and COOs of large firms.

Data Sources

I assembled the data for my archival study from multiple sources including, Standard and Poor's Compustat and Capital IQ databases and the Thomson Reuters StreetEvents database. I used the Execucomp and People Intelligence datasets from Standard and Poor's to identify leaders and seconds as well as to obtain detailed executive profiles including compensation information, functional backgrounds, and board memberships. I obtained firm financial information from Compustat's Annual Fundamentals. I also obtained firm and industry financial ratios from Wharton Research Data Services' (WRDS) Financial Ratios Suite. Finally, I obtained transcripts of earnings calls and other company events from Thomson Reuters StreetEvents database.

Although data from these various sources were readily available, cleaning and verifying the data and then matching the actors (leaders and second) and their firms across datasets took significant effort. The process of preparing and analyzing the data resulted in roughly 15,000 lines of SQL, 4,500 lines of R code, 3,000 lines of Python code, and 2,500 lines of SPSS syntax. One of the main challenges was extracting data from the more than 120,000 earnings call transcripts and connecting it to the other datasets. This required the development of Python programs that first identified the various speakers on calls and then consolidated all of the text from each speaker. I then combined all of the text for each speaker across all of the earnings calls they appeared on. To accomplish this, I needed to develop code that could perform name matching while accounting for differences in the spelling and misspelling of names (e.g. Phillip versus Philip; Kathryn versus Catherine) as well as differences in the use of salutations, nicknames, and the ordering of first and last names. I also developed name matching code that connected the transcript data to the Execucomp and People Intelligence datasets, and connected

the Execucomp and People Intelligence datasets to each other. Although the name matching programs performed the bulk of the work, manual review and connecting of roughly 10 percent of the matches was needed to address errors and duplicate matches.

Sample

My sample includes all leaders and seconds from firms in the S&P 1500 who appeared in earnings call transcripts between the years 2002 and 2017. The sample was limited to calls after the year 2001 because prior to that date the available transcripts used a different and less consistent format that made extracting data problematic. Because job titles were inconsistently formatted and were often missing from the transcripts, leaders and seconds were identified after the transcript data was combined with the Execucomp data.

Leaders were identified as those individuals who were flagged in Execucomp as being the CEO for all or most of the year. Seconds were identified as those individuals with the title of COO or President for all or most of the year. The use of both the COO and President titles to identify seconds is consistent with prior studies in the TMT literature (e.g. Hambrick & Cannella, 2004; Marcel, 2009; Zhang, 2006). When the title of President is held by someone other than the CEO it typically indicates the presence of a second (Hambrick & Cannella, 2004). For ease of exposition, I refer to all of these seconds as COOs hereafter. After identifying all of the individuals with COO or President in their titles I reviewed each record to eliminate executives who were the COO or President of a division rather than of the entire firm. I also examined every instance in which the COO changed during a fiscal year to ensure that I retained only the COO who was in place the majority of that year (this was not necessary for CEOs because a flag in the Execucomp data provided this information). In my final sample, 44 percent of seconds held only the title of COO, 30 percent held only the title of President, and the

remaining 26 percent held both titles. I found ten cases in which the titles of CEO, COO, and President were held by three different people. For each of these cases, I designate the person holding the title of President as the second.

Unlike some prior studies (e.g. Hambrick & Cannella, 2004; Marcel, 2009) I did not attempt to exclude heir apparents from the sample. However, I statistically controlled for whether or not the second was an heir apparent. I follow the precedent set in prior studies for identifying heir apparents as COOs who are more than four years younger than their CEO (e.g. Hambrick & Cannella, 2004; Zhang, 2006). Although this operationalization is not precise, it is the standard in the literature and it allows my findings to be easily compared to earlier studies. In addition, there are no readily available alternative operationalizations in the archival data.

Measures

Personality. Although direct measures of CEO and COO personality are not available, it is possible to obtain unobtrusive measures (e.g. Chatterjee & Hambrick, 2007; 2011). Numerous studies have identified systematic associations between personality and both written and spoken language (e.g. Fast & Funder, 2008; Hirsh & Peterson, 2009; Mairesse et al., 2007; Mehl, Gosling, & Pennebaker, 2006; Pennebaker & King, 1999; Schwartz et al., 2013; Yarkoni, 2010). Therefore, a sample of the language used by executives can provide insights into their personalities. Fortunately, the transcripts of earnings conference calls were available and could be gathered from the Thomas Reuters StreetEvents database. I chose to use earnings calls rather than other types of cooperate communications because executives are less constrained and more directly responsible for the content of these calls than they are for the more scripted and often ghost-written statements made in official publications, such as annual reports or letters to shareholders (Bowen, Davis, & Matsumoto; Li, 2008).

Corporate earnings calls are typically divided into two parts. In the first part, an executive, typically the CEO, reads a prepared statement about the most recent earnings report. In the second part, financial analysts and others on the call ask the executives questions and the executives respond. I used only the data from this second part of the call because the question and answer (Q&A) section captures the spontaneous utterances of executives rather than their carefully worded and prepared statements. Prior work on personality has shown that spontaneous utterances can useful in predicting Big Five personality traits (e.g. Mairesse et al., 2007; Mehl, et al., 2006). In addition, the language and tone of executives during the Q&A portion of earning calls has been shown to be a better predictor of future firm actions and performance than the linguistic features of their prepared statements (e.g. Camiciottoli, 2011; Davis et al., 2015; Price et al., 2012).

I used three different text analysis techniques to obtain measures of executive personality from the earnings call transcripts. The use of multiple techniques stems from the fact that there is no consensus about the best way to measure personality from spoken words. In addition, using multiple algorithms is considered best practice for maximizing the accuracy of computer-aided text analysis (McKenny et al., 2016).

My first technique relies on predefined data dictionaries. This is a "closed vocabulary" approach, meaning it works on a set of predefined words and categories (Schwartz et al., 2013). This can be contrasted with an "open vocabulary" approach, which examines all of the words in a text. The data dictionaries I used each consisted of a list of categories along with a series of words that fell into each of those categories. Prior studies have found that the proportion of a person's words that fall into certain predefined categories is dependably correlated with self-reported Big Five personality scores (e.g. Pennebaker & King, 1999; Mehl, et al., 2006; Yarkoni,

2010). For example, there is a significant negative correlation between a person's openness and their use of third-person pronouns and past tense verbs (Mehl, et al., 2006). To implement this approach and obtain scores for each of the Big Five traits, I relied on a tool developed by Mairesse et al. (2007). They used two different language data dictionaries to train models that can analyze a person's verbal statements and return a score for each of the Big Five personality traits. This personality recognizer tool (PRT), uses both the 2001 Linguistic Inquiry and Word Count (LIWC) data dictionary (Pennebaker, Francis, & Booth, 2001) and the Medical Research Council (MRC) Psycholinguistic Database (Coltheart, 1981). Both of these dictionaries have previously been used to examine the links between the linguistic features of a person's language and their personality traits (e.g. Gill & Oberlander, 2003; Pennebaker & King, 1999). The PRT returns a number between 1 and 7 for each of the Big Five traits. The correlations between these scores and observer ratings of these traits ranged between $r = 0.54$ for extraversion and $r = 0.44$ for conscientiousness. The correlations between PRT scores and self-reported measures of the Big Five ranged between $r = 0.33$ for openness and $r = 0.24$ for neuroticism.

My second technique uses an open vocabulary approach that is based on latent semantic analysis (LSA). The difference between the PRT and LSA techniques is that, rather than simply categorizing the words a person uses, LSA considers the semantic meaning of the words (Landauer & Dumais, 1997). Latent semantic analysis is based on the notion that words with similar meanings tend to appear together. The co-occurrences of words across different bodies of text suggests that those words are related. Words can also be related to one another even when they do not co-occur in the same text, as long as both words co-occur with other shared words. The LSA computational model works by first building an n-dimensional semantic space out of a

set of text samples. Once this semantic space is built it can be used to see how closely related different words and sections of text are to each other.

Kwantes et al. (2016) demonstrated that LSA can be used to measure personality. This is done by first building a semantic space out of a corpus of documents. I built a semantic space using the 120,000 earnings call transcripts I had already obtained. The advantage of doing this rather than using a generic set of documents is that the semantic space is domain-specific. Personality scores are calculated by first projecting a so-called trait vector into the semantic space and determining how close those vectors are to the vector created from the written or spoken words of a person. Because the distance between vectors is calculated as a cosine, the resulting scores are always between -1 and 1. The trait vectors are created by summing the vectors of a group of trait-related words. For example, the openness trait vector is the sum of the vectors for words such as original, novelty, curious, different, and ingenious. A full list of words used to construct each trait vector appears in Appendix D. Kwantes et al. (2016) found that when the semantic space was built using a large number of documents (50,000 or more) the correlations to self-reported Big Five measures could reach $r = 0.25$.

The final technique I used relies on machine learning algorithms and an open vocabulary approach. This method uses artificial intelligence to train models that can predict personality based on the n-grams found in a person's language (Schwartz et al., 2013). To implement this technique, I relied on IBM's Waston Personality Insights service (IBMPI), which is an open-vocabulary model that is similar to other models that have been used previously in academic research (IBM, 2018; Schwartz et al., 2013). The service takes a block of text and returns scores for each trait on a scale of 0 to 1. According to IBM, the average correlation between these scores and self-reported big five scores is $r = 0.28$.

The reliability of text-based measures of personality begins to level off after the first 3,000 words, although it can show improvement up to the first 10,000 words (Boyd, 2018). Therefore, I use up to the first 10,000 words available for each individual. I also removed any individuals who do not have a minimum of 300 words available. This is the minimum number of words required for IBMPI to return a result. In addition, I found that when individuals have an extremely small number of words (e.g. less than ten) the PRT algorithm can sometimes return results outside of the expected range of 1 to 7.

I originally planned to average the scores from these three different algorithms to create a single measure. However, poor correlations between the scores from different algorithms made this infeasible. Most problematic were the two significant negative correlations, one between IBMPI extraversion and LSA extraversion ($r = -0.06$) and the other between IBMPI neuroticism with PRT neuroticism ($r = -0.06$). See table 3 for the full list of correlations. As a result of these issues, I chose to analyze results from each algorithm separately and consider the overall pattern of relationships. If at least two of the algorithms converge on the same result I can reasonably conclude with some confidence that a relationship exists.

I also took additional psychometric steps to examine the reliability of these measures. First, I examined their split-half reliability. I randomly selected 500 executives who spoke at least 300 words on two different earnings calls. I then randomly assigned each conference call to one of two groups. I ran all three text analysis algorithms on the two groups of earnings calls separately and examined the correlations between the resulting scores. The results are in Table 4. All but one of the correlations was greater than 0.5 (PRT Neuroticism, $r = 0.45$) and the majority lay between $r = 0.6$ and $r = 0.8$. Although there is no widely agreed upon cutoff for split-half reliabilities, these correlations are comparable to the test-retest reliability of the self-reported Big

Five Inventory (BFI) over similar time periods. Prior studies have shown the test-retest reliability of the BFI dimensions over 3 years to be between r = 0.62 and r = 0.70 (Vaidya et al., 2008) and over 2 months to be between r = 0.79 to r = 0.89 (Chmielewski & Watson, 2009). In my sample, the earnings calls were a minimum of three months apart.

To evaluate the reliability of these measures *across contexts* and ensure I am capturing the personality of individuals rather than aspects of the company culture, I examined all of the executives in my sample who changed companies. I identified 331 executives who appeared on at least one conference call at two different companies. This was done by first matching the data from the transcripts for each company to executives in the Execucomp dataset. I was then able to track executives across companies by using a unique identifier that was assigned to them in Execucomp. The correlations between the Big Five dimensions for each algorithm before and after these executives change companies are in Table 5. These correlations ranged between r = 0.23 and r = 0.61 and all were significant at $p < 0.01$. The strong correlations indicate that these measures are capturing an individual trait that is relatively stable across contexts.

Expertise. Among TMT members, differences in functional background lead to the development of different types of expertise (Bunderson, 2003; Bunderson & Sutcliffe, 2002). For that reason, I rely on functional background similarity as a measure of expertise similarity. Similarity of functional backgrounds in TMTs has been operationalized in a variety of ways (Bunderson & Sutcliffe, 2002). One of the most common approaches is to compare the degree of difference in the complete functional backgrounds of team members. Full job histories are typically collected using surveys and the amount of time team members have spent working in different areas is compared. Unfortunately, I do not have nor can I readily obtain the complete job histories for each executive. The Execucomp and People Intelligence datasets only contain

background information starting from the time the individual became a high ranking executive in a firm. As a result, rather than comparing the complete functional backgrounds of CEOs and COOs, I will compare their dominant functional backgrounds (as members of the TMT). An executive's dominant functional background is the area in which they spent the most time and have the most experience. Dominant functional backgrounds are also used frequently in the TMT literature to examine functional background diversity (see Bunderson & Sutcliffe, 2002 for a review). Since individuals who rise to the rank of top executive are likely to do so in the area where they have spent the majority of their career (e.g. CFOs have typically spent most of their careers in finance), it is reasonable to use the Execucomp and People Intelligence data to identify an individual's dominant functional background.

Typically, executive experience is classified into one of nine functional areas: sales or marketing, manufacturing, finance or accounting, personnel/ HR, distribution or warehouse, R&D, equipment management, administrative support, and general management (Bunderson & Sutcliffe, 2002). With the help of a research assistant, I classified each executive's dominant functional background into one of these areas by examining their job titles prior to becoming CEO or COO. I divided the executives in my sample into two halves and the research assistant and I each coded one of the halves. To ensure that our categorization was reliable, we both coded a random sample of 100 executives. I assessed our interrater reliability by calculating the bias-corrected Cohen's Kappa using the procedure outlined by Siegel and Castellan (1988). The Kappa was 0.74, which is in the range of what Landis and Koch (1977) considered substantial agreement and which Krippendorff (1980) considered high enough to proceed with interpretation of the data.

Studies of TMT functional background diversity have typically used Blau's Index or the mean Euclidian distance between pairs of team members as measures of similarity (e.g. Bunderson, 2003; Bunderson & Sutcliffe, 2002; Cannella, Park, & Lee, 2008; Sutcliffe, 1994). However, because I am measuring similarity in a leader-second dyad rather than an entire team, these indices cannot be used. Instead, I used a categorical variable to indicate whether the CEO and COO's dominant functional backgrounds were the same or different. Unfortunately, the majority of executives (47 percent) were classified into the general management category. Executives were put into this category only when their job titles did not indicate that they belonged to any of the other functional background categories (i.e. they only had generic titles such as 'executive vice president' or 'director'). After examining the data, it appeared that most of the time when both executives were categorized as general management it was because the company did not provide sufficiently specific job titles (rather than it stemming from both parties truly having a general management background). Therefore, I put these dyads into a third category and analyzed them separately.

Status Distance. As with personality similarity, an unobtrusive measure of status distance is needed. To do this I followed accepted practices in the TMT literature by using previously validated measures of executive power and status to create a composite index of hierarchical differences between executives (e.g. Cannella & Shen, 2001; Zajac & Westphal, 1996). I used the following well validated indicators of an executive's standing in the social hierarchy to construct my measure: membership on the firm's board (e.g. D'Aveni & Kesner, 1993), compensation (e.g. Cannella & Shen, 2001; Daily & Johnson, 1997; Finkelstein, 1992), percent of total shares held (Daily & Johnson, 1997; Dunn, 2004; Finkelstein, 1992; Zajac & Westphal, 1996), and firm tenure (Cannella & Shen, 2001; Zajac & Westphal, 1996). This index is similar

to one that was used to measure the effects of power differences between co-CEOs (Krause et al., 2015). Although status is conceptually different from power, they are both the basis for hierarchical differentiation and they are mutually reinforcing (Magee & Galinsky, 2008). Therefore, it is reasonable that similar indicators would be used. In addition, indicators such as firm tenure may be more likely to reflect conferred social respect (status) than control over resources (power).

To construct my measure I followed the procedure used by Cannella and Shen (2001) and Krause et al. (2015). I first standardized the indicators, then I summed the differences between the leader and second on each one, and finally I standardized the composite measure.

Collective Performance. For CEOs and COOs, the unit they lead is the entire firm, therefore, collective performance is measured as firm performance. Two types of measures of firm performance have been widely used in the TMT literature to assess the impact of CEOs and COOs: accounting measures such as return on assets (ROA), and market-based measures such as market to book ratio (MTB) (e.g. Hambrick & Cannella, 2004; Hambrick & Quigley, 2014). However, using market-based measures of performance creates both theoretical and methodological problems. First, as I argued in the introduction, little attention is paid to seconds outside of the firm. As a result, there is no reason to suspect that financial analysts and markets more broadly will have significant reactions to the personality and expertise of both the leader and the second. As I discussed in my literature review, markets do react to the presence of an heir apparent (Davidson et al., 2001; Shen & Cannella, 2003). However, it is unlikely that they go beyond that and consider leader-second characteristics, especially for traits such as personality, which are harder to detect at a distance. The second issue is methodological. Changes in market performance involve relatively short-lived responses to specific events. For

this reason, an event study of market responses to the formation of the leader-second dyad is the most appropriate way to measure impacts on market performance. However, this conflicts with the long-term nature of the independent variables whose measurement involves dyadic similarity or difference aggregated over a period of years. For these reasons, I chose to focus only on the accounting measure of ROA. To account for the outliers that are common in measures such as ROA, I winsorized the data at the 1st and 99th percentiles (Dixon, 1960), a common practice in the TMT literature (Certo et al, 2018).

Controls. I reviewed the prior studies of COOs to identify potential control variables (e.g. Hambrick & Cannella, 2004; Marcel, 2009; Zhang, 2006). Based on this review, I control for: prior firm performance, industry performance, firm size, TMT size, number of years the dyad was together, and heir apparent status of the second. I operationalize prior performance as average firm ROA for the three years prior to the dyad's formation. For industry performance, I use the average ROA for firms in the same industry, based on the Fama-French 48 industry classification system (Fama & French, 1997). Firm size is calculated as the natural log of the firm's average revenue during the time the dyad was together. TMT size in the average number of executives listed in the Execucomp database (which includes only the people listed in the firm's quarterly reports) during the years the dyad was together. It is calculated after excluding people who were board members that did not work for the company. Heir apparent status of the second is marked as true whenever the second is 4 or more years younger than the leader (Hambrick & Cannella, 2004).

Analysis

I followed the procedure in Hambrick and Cannella (2004) of averaging the performance of the dyad over the time period they were together. Hambrick and Cannella argued that "the advantage of this approach is that it avoids the problem of trying to detect any immediate cross-sectional (or short-lagged) performance effects from having a COO; with adequate controls, it also avoids the inherent difficulty in interpreting any observed association as evidence of an effect rather than a cause" (2004: 972). Although I am examining leader-second characteristics rather than the presence of the COO, the same arguments apply. The other advantage of using this approach is that it makes addressing the problems related to difference scores relatively straightforward since polynomial regressions can easily be performed. I discuss these issues next.

Ample scholarly attention has been paid to the problems that emerge from using the difference between two continuous variables to analyze the effects of similarity or difference between entities or variables (Edwards, 2001a, 2001b). Among these problems are issues of poor reliability, failure to account for differences in the variance of the variables, and the imposition of restrictive assumptions that might not be met and that go untested (Edwards, 2001b). To overcome these issues I use polynomial regression with response surface analysis to test Hypotheses 1-3, which are about the effects of personality differences. The downside of this approach is that it requires a large sample to have sufficient power, however, this is not an issue given the size of my dataset (Edwards, 2001b).

Polynomial regression allows me to examine how two variables (leader and second personality) simultaneously affect an outcome (ROA) by representing that relationship in three-dimensional space. The examples in Figure 2 show what such a relationship might look like. Figure 2a shows an idealized image of an incongruence effect, in which the outcome Z is highest

when the X and Y variables are maximally different. Figure 2b is an idealized image of a congruence effect, in which the outcome Z is highest when there is agreement between the X and Y variables. On the floor of the graph in Figure 2b are two lines. The solid line is the line of congruence where Y = X. The dashed line is the line of incongruence where Y = -X. Response surface analysis is primarily concerned with evaluating the slope and curve of the surface along these two lines.

To perform the analysis, I must first scale-center all of my predictor variables by subtracting the mid-point of the scales (Edwards & Parry, 1993; Edwards, 1994). I then fit a polynomial regression model to the data using the following general equation (this does not include the controls, which are added as separate variables):

$$Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2 + e$$

Substituting Y = X gives me the equation for the line of congruence, which, after simplification, is:

$$Z = b_0 + (b_1 + b_2)X + (b_3 + b_4 + b_5)X^2 + e$$

This shows that the slope of the line of congruence is given by $b_1 + b_2$ and the curvature is given by $b_3 + b_4 + b_5$. These are typically labeled a_1 and a_2 respectively. A similar substitution with Y = -X results in the following equation for the line of incongruence:

$$Z = b_0 + (b_1 - b_2)X + (b_3 - b_4 + b_5)X^2 + e$$

Here, the slope of the line of incongruence is given by $b_1 - b_2$ and the curvature is given by $b_3 - b_4 + b_5$. These are labeled a_3 and a_4 respectively. To test whether the slope and curvature along these two lines are significantly different from zero, I first obtain the unstandardized coefficients

for b_1 through b_5. I then use existing procedures for testing linear combinations of regression coefficients (Cohen & Cohen, 1983). In addition to these slopes and curves, I also test whether the location of the principal axes - which are the ridges along the response surface where Z is highest and lowest - are aligned with the line of congruence. This involves a non-linear combination of regression coefficients and so it must be tested using the bootstrap method (Efron & Tibshirani, 1993). For each those tests, I create a 10,000 bootstrap sample and use the results to construct bias-corrected confidence intervals (Edwards, 2002).

The moderation proposed in Hypotheses 7 and 8 can be tested by adding the moderator variable W and its products to the basic polynomial regression equation, which yields the following:

$$Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2 + b_6W + b_7WX + b_8WY + b_9WX^2 + b_{10}WXY + b_{11}WY^2 + e$$

If the addition of these W-related terms results in a significant increase in R^2 then moderation is present. The form of the moderation is examined by substituting various levels of W into the equation and examining the response surfaces, much as is done in simple slopes tests (Hayes, 2013). Substituting Y = X and Y = -X yields the following two equations for the lines of congruence and incongruence:

$$Z = (b_0 + b_6W) + [b_1 + b_2 + (b_7 + b_8)W]X + [b_3 + b_4 + b_5 + (b_9 + b_{10} + b_{11})W]X^2 + e$$

$$Z = (b_0 + b_6W) + [b_1 - b_2 + (b_7 - b_8)W]X + [b_3 - b_4 + b_5 + (b_9 - b_{10} + b_{11})W]X^2 + e$$

These equations can be used to test linear combinations of coefficients at different levels of W and examine the slope and curvature along the lines of congruence and incongruence at these levels.

Hypotheses 5 and 6 deal with elevation in personality traits. These can be tested with simple linear regressions, using mean level of conscientiousness and neuroticism in the dyad as the predictor. The mean in a dyad has been used previously in LMX personality research (e.g. Bernerth et al, 2007; Kamdar & Van Dyne, 2007). The mean is also the most common operationalization of team personality composition and generally has the strongest links to team performance (Bell, 2007). Because expertise similarity is a categorical variable I test it using an ANCOVA.

As I stated previously, I do not test hypotheses related to the mediating mechanisms at this time (Hypotheses 9 and 10).

CHAPTER 6: RESULTS

Table 6 contains the descriptive statistics and correlations between all of the variables in my sample. All statistical tests are two-tailed unless otherwise noted. The sample size for these the tests was n = 1847 dyads.

Personality

Hypotheses 1-3 predict that, as the differences between leaders and seconds in extraversion, agreeableness, and openness increase, collective performance will improve. This is considered an incongruence or complementarity effect, meaning that as the difference between two variables widens the outcome variable goes higher. This type of effect pictured in Figure 2a. Before discussing the results of my tests for these incongruence effects, I will first briefly review the procedure for testing them. Two conditions must be met for the presence of an incongruence effect to be supported (Edwards & Cable, 2009). First, the curvature of the surface along the line of incongruence (Y= -X) must be significant and positive, $a_4 > 0$ (Humberg, Nestler, Back, 2018). When this is true the surface forms a U shape along this line (see Figure 2a). The second condition has to do with the location of the "ridge" or line along which the value of Z is lowest. This line is called the "second principal axis." For an incongruence effect to be present, this line must lay along the line of congruence (Y = X). An example of this can be seen by examining the bottom of the curve in Figure 2a, which appears to fall roughly along the line where Y = X. To determine if this is the case, I test whether the intercept of the second principal axis is significantly different from 0 ($p_{20}=0$) and the slope is significantly different from 1 ($p_{21}=1$). If either the intercept or the slope is different from these values, then the second principal axis does not coincide with the line of congruence (Edwards & Cable, 2009; Humberg, Nestler, Back,

2018). However, failure to meet this second condition does not mean that an incongruence effect is not present. Instead, it becomes necessary to evaluate the location of the second principal axis and determine if an incongruence effect is present at a different location (Edwards & Cable, 2009; Edwards & Parry, 1993). For example, if the second principal axis crosses the line of congruence within the range of the predictor variables then an incongruence effect may still be present, but only in the area where those lines cross (Edwards & Cable, 2009). It is also best practice to examine the shape of the surface along the line of congruence. If there is any slope or curve along this line ($a1 \neq 0$ or $a2 \neq 0$), this could indicate that there are main effects in addition to the incongruence effect. However, as long as these main effects are theoretically justifiable, this is not grounds for rejecting the incongruence hypothesis (Edwards & Cable, 2009; Humberg, Nestler, Back, 2018).

Table 7 contains the controls-only model for predicting firm ROA. It is the same regardless of the personality, expertise, or status distance variables being tested. Therefore, I provide this in a separate table to avoid repetition in each of these subsequent tables.

Table 8 contains the regression models for testing Hypothesis 1, which states that differences in extraversion between leaders and seconds increase collective performance. For each of the three text analysis algorithms, I first entered a model with *leader extraversion only*. I then enter the full model, which includes the second and the polynomial terms that are needed to evaluate differences in extraversion. The surface tests are performed by testing linear combinations of coefficients. Because this procedure requires the use of unstandardized coefficients, all of the coefficients in these tables are unstandardized. Table 9 contains the response surface tests for each of the three text analysis algorithms for extraversion. Condition 1 for an incongruence effect ($a_4 > 0$) was met only for the LSA text analysis algorithm (a_4=4.84,

SE=2.17, *p*=.025). To aid in the interpretation of the results I have plotted all of the response surfaces with a significant a_4 coefficient along with their principal axes. The response surface for LSA extraversion on ROA is pictured in Figure 3. As the positive a_4 coefficient indicates, the surface has a characteristic U shape along the line of incongruence. The bottom of the curve appears to be somewhat bowl-shaped. However, neither a_1 nor a_2 were significantly different from 0 (a_1=0.004, *SE*=0.09, *p*=.96; a_2=1.67, *SE*=0.89, *p*=.062), meaning that the null hypothesis that there is no slope or curve along the line of congruence could not be rejected. To evaluate condition 2, I tested the slope and intercept of the second principal axis by creating a 10,000 bootstrap sample and using it to construct bias-corrected confidence intervals. The confidence interval for the intercept did not include zero, however, the interval for the slope did include 1 (p_{20} = -0.07, 95% CI[-0.47, -0.02]; p_{21} = 1.29, 95% CI[0.06, 5.83]), therefore condition 2 was only partially met. Figure 4 contains a plot of both the second principal axis for LSA extraversion and the line of congruence. Although the second principal axis appears to intersect the line of congruence, the confidence interval for the slope of the axis included 1, meaning that the lines may be actually parallel. However, because intercept was significant and negative, I can conclude that firm ROA is at its *lowest* when seconds are slightly less extraverted than leaders. Overall all this pattern of results suggests that an incongruence effect is present for extraversion. However, because the effect was supported for only one of the three text analysis algorithms, I conclude that Hypothesis 1 is only partially supported.

Hypothesis 2 states that differences in openness between leaders and seconds increase collective performance. Tables 10 and 11 contain the regression results and the response surface tests respectively for openness from all three text analysis algorithms. Condition 1 for an incongruence effect ($a_4 > 0$) was met for both the IBMPI (a_4=50.75, *SE*=24.53, *p*=.039) and LSA

algorithms (a_4= 4.66, *SE*= 1.90, *p*= .014). These response surfaces are pictured in Figures 5 and 7. The U shape along the line of incongruence is somewhat distorted in Figure 5 (IBMPI), however, the positive a_4 coefficient indicates that it is present. In Figure 7 (LSA) the U shape is clearly visible. For IBMPI, condition 2 for an incongruence effect was not met. The confidence interval for the intercept of the second principal axis did not include zero, and the confidence interval for the slope did not include 1 (p_{20} = 0.16, 95% CI[0.07, 0.25]; p_{21} = 0.49, 95% CI[0.22, 0.78]). Figure 6 contains a plot of the second principal axis for IBMPI openness. The axis crosses the line of congruence when both leaders and seconds are high on openness, which suggests that differences in openness only have a positive effect on ROA when both members of the dyad are high on this trait. For LSA condition 2 was met. The confidence interval for the intercept of the second principal axis included zero, and the confidence interval for the slope included 1 (p_{20} = -0.05, 95% CI[-0.44, 0.04]; p_{21} = 1.09, 95% CI[0.19, 3.31]). For both algorithms, neither a_1 nor a_2 were significantly different from 0 (IBMPI: a_1=20.67, *SE*=12.08, *p*=.087; a_2=-33.84, *SE*=19.11, *p*=.077; LSA: a_1=20.67, *SE*=12.08, *p*=.087; a_2=-33.84, *SE*=19.11, *p*=.077), indicating that there was no slope or curve along the line of congruence. Overall, the pattern of results for two of the three algorithms supported the conclusion that an incongruence effect was present for openness. Thus Hypothesis 2 is supported.

Hypothesis 3, states that differences in agreeableness between leaders and seconds increase collective performance. Tables 12 and 13 contain the regression results and the response surface tests respectively for agreeableness from all three text analysis algorithms. Condition 1 for an incongruence effect ($a_4 > 0$) was not met for any of the algorithms. However, a_4 was significant and negative for both IBMPI (a_4= -15.85, *SE*= 7.15, *p*=.027) and LSA (a_4= -6.45, *SE*= 1.85, *p*= .001). This suggests that there may be a congruence rather than an incongruence effect

for agreeableness. To evaluate this possibility, I followed the procedure for testing for a congruence effect. This procedure is similar to the one for testing for an incongruence effect, but with a few alterations. The first condition for a congruence effect is that the curvature along the line of incongruence must be significant and negative (rather than positive), $a_4 < 0$ (Edwards & Cable, 2009; Edwards & Parry, 1993). The second condition is that the first principal axis must coincide with the line of congruence. The first principal axis is the line along which ROA is highest (as opposed to lowest for the second principal axis). This second condition is met when the intercept of the first principal axis is 0 and the slope is 1 ($p_{10}=0$ and $p_{11}=1$). The response surfaces for IBMPI and LSA agreeableness are pictured in figures 9 and 11. Both figures show that the response surfaces have a clear inverted U shape along the lines of incongruence. For IBMPI condition 2 for a congruence effects was also met. The confidence interval for the intercept of the first principal axis included zero, and the confidence interval for the slope included 1 (p_{10} = -0.34, 95% CI[-2.45, 2.40]; p_{11} = 2.59, 95% CI[-10.72, 12.89]). For LSA condition 2 was only partially met. The confidence interval for the intercept of the first principal axis did not include zero, however, the confidence interval for the slope included 1 (p_{10} = -0.05, 95% CI[-0.16, -0.004]; p_{11} = 1.31, 95% CI[0.79, 2.40]). Figure 12 contains the plot of the first principal axis for LSA agreeableness. The intercept is negative and the confidence interval is only slightly below zero, indicating that that ROA is highest (rather than lowest) when seconds are slightly less agreeable than leaders. For both algorithms, neither a_1 nor a_2 were significantly different from 0 (IBMPI: a_1= 2.94, *SE*= 1.80, *p*=.103; a_2=-6.867, *SE*= 4.63, *p*=.139; LSA: a_1=-0.12, *SE*=0.188, *p*=.513; a_2=0.926, *SE*= 1.28, *p*=.470), indicating that there was no meaningful slope or curve along the line of congruence. Overall, two of the three algorithms support the conclusion that a congruence effect is present for agreeableness. Thus Hypothesis 3 is not

supported. However, there is evidence that leader-second similarity in agreeableness improves collective performance.

Hypothesis 4 states that the level of conscientiousness in leader-second dyads is positively related to collective performance. Table 14 contains the regression results for conscientiousness from all three text analysis algorithms. In addition to testing for the effects of the average level of conscientiousness in the dyad, I conducted an exploratory analysis to look for congruence or incongruence effects. The results of these surface tests are in Table 15. There was a positive main effect of average conscientiousness for the IBMPI algorithm only (B=0.373, *SE*=0.117, t= 3.20, *p*=.001). Because only one of the algorithms was significant, I conclude that there is only partial support for Hypothesis 4. The response surface tests for IBMPI indicated that a congruence effect may also be present (see Figure 13). Condition 1 for a congruence effect ($a_4 < 0$) was met (a_4=-25.11, *SE*= 8.90, *p*=.005), indicating that there is an inverted U shape along the line of incongruence. Condition 2 was also met (p_{10} = -0.05, 95% CI[-0.27, 0.03]; p_{11} = 1.32, 95% CI[0.83, 2.50]). This pattern of results indicates support for a congruence effect. Because both the main effect and the congruence effect were present for only one of the algorithms, these results suggest that there is only partial support for the conclusion that leader-second similarity in conscientiousness improves performance, and that it is best if conscientiousness is high for both executives.

Hypothesis 5 states that the level of neuroticism in leader-second dyads is negatively related to collective performance. Table 16 contains the regression results for neuroticism from all three text analysis algorithms. As with conscientiousness, I also conducted an exploratory analysis to look for congruence or incongruence effects. The results of these surface tests are in Table 17. There was no significant effect of average neuroticism for any of the three algorithms.

Thus, Hypothesis 5 was not supported. The response surface tests for IBMPI indicated that a congruence effect may be present (see Figure 15). Further analysis revealed that condition 1 (a_4=-32.45, *SE*= 9.77, *p*=.001), and condition 2 (p_{10} = -0.004, 95% CI[-0.05, 0.02]; p_{11} = 1.27, 95% CI[0.69, 2.84]) for a congruence effect were both met. Because the congruence effect was present for only one of the algorithms, these results suggest only partial support for the conclusion that leader-second similarity in neuroticism improves performance.

Expertise

Hypothesis 6 predicted that leaders and seconds with different areas of expertise will perform better than dyads where both members have the same expertise. To test this I performed an ANCOVA comparing the means between groups. Recall that I create three groups: 1) both parties classified as general management, 2) leaders and seconds have the same functional background, and 3) leaders and seconds have different functional backgrounds. The results of my analysis are in Table 18. I did not find a significant difference between groups ($F_{(2, 1838)}$=0.93, *p*=0.40). One reason for this result may be that the job titles in the Execucomp and People Intelligence datasets do not provide enough history to identify some executive's dominant functional background. This may explain why 47 percent of executives were classified into the general management category. To explore this possibility, I performed a second analysis which included only those dyads for which neither executive was classified as having a general management functional background. By excluding executives in general management category, I limited this test to only those individuals whose functional backgrounds were readily identifiable from the job titles that were available. The results of this analysis are in Table 19. For this analysis, there were only two groups (all of group 1 was filtered out). Again, I found no significant difference in firm performance between groups of companies with leader and seconds

that had the same versus different functional background ($F_{(1, 524)}$=0.24, p=0.62). Therefore, Hypothesis 6 is not supported.

Moderation by Status Distance

Hypothesis 7 predicted that status distance would moderate the relationships between collective performance and differences in extraversion, agreeableness, and openness. I hypothesized that lower status distance would strengthen the predicted positive relationships, that is, when a leader and second are at nearly the same status, personality differences should have a more positive effect. The results of these analyses are in Tables 20 through 22. Because interactions may be present even when there is no main effect, I examined all three algorithms for all three of the personality traits. Moderation is present if the change in R-squared from adding the five interaction terms is significant (Edwards, 2002). I found significant moderation by status distance for PRT Extraversion (ΔR^2=.005, $F_{(5,1829)}$=3.54, p=.003), IBMPI Extraversion (ΔR^2=.004, $F_{(5,1829)}$=2.83, p= .015), PRT Openness (ΔR^2=.006, $F_{(5,1829)}$=4.28, p= .001), IBMPI Openness (ΔR^2=.005, $F_{(5,1829)}$=3.57, p= .003), PRT Agreeableness (ΔR^2=.004, $F_{(5,1829)}$=2.82, p= .015), and IBMPI Agreeableness (ΔR^2=.004, $F_{(5,1829)}$=2.84, p= .015). Although the changes in R-squared are small, small effect sizes are common for three-way interactions such as this. In addition, even relatively small proportions of variance explained can translate into practically meaningful absolute differences in firm performance.

To examine the form of the moderation, I plotted the response surfaces with status distance at one standard deviation above and below the mean. These plots appear in Figures 17 through 22. Examining Figure 17 reveals that the shape of the surface along the line of incongruence goes from U shaped at higher status distances, to an inverted U at lower status distances. This suggests that at higher status distances there is an incongruence effect for PRT

extraversion, which may be reversed at lower status distances. This is the opposite of the expected direction. However, Figure 18 suggests the reverse. For IBMPI extraversion there appears to be an incongruence effect at lower status distances and a congruence effect at higher status distances. For PRT openness and IBMPI openness, Figures 19 and 20 both show a slight strengthening of the incongruence effect at lower status distances. This is confirmed by examining the a_4 coefficients for each curve, which become more positive at lower status distances (PRT openness: $a_{4,+1s.d.}$= .162, $a_{4,-1s.d.}$= .258; IBMPI openness: $a_{4,+1s.d.}$=34.67, $a_{4,-1s.d.}$=74.70). For PRT agreeableness and IBMPI agreeableness, Figures 21 and 22 show a weakening of the *congruence* effect at lower status distances. This is again confirmed by an increase in the a_4 coefficients for both curves (PRT agreeableness: $a_{4,+1s.d.}$= -.768, $a_{4,-1s.d.}$= .018; IBMPI agreeableness: $a_{4,+1s.d.}$= -17.68, $a_{4,-1s.d.}$= -16.05). Overall, five out of the six significant moderation effects were in the expected direction. This provides support for hypothesis 7, that lower status distance makes effects of personality differences more positive.

Hypothesis 8 predicted that status distance would moderate the relationship between collective performance and differences in expertise. I predicted that lower status distance would strengthen the relationship, that is, differences in knowledge and experience would become more critical when the leader and second were more similar in status. I performed the analysis both with and without executives that were categorized as having general management functional background. Results of these analyses are in Table 23 and Table 24. The interaction term was not significant in either analysis ($F_{(2,1835)}$=0.29, p= .747; $F_{(1,522)}$=0.12, p= .724), indicating that moderation was not present. Thus, Hypothesis 8 is not supported.

In addition to the moderation analysis, I conducted an exploratory analysis to look for any main effects of status distance. There was a positive and significant zero-order correlation

between status distance and firm ROA (r = .09, $p < .001$). This positive relationship held even after performing a regression with control variables, see Table 25 (B=.004, *SE*=.002, t= 2.48, *p*=.013). This suggests that overall, status distance is beneficial in leader-second dyads.

CHAPTER 7: DISCUSSION

Summary of Findings

The results of my quantitative archival study support the conclusion that characteristics of leader-second dyads have an impact on the units they lead. I found evidence that the personality traits of leaders and seconds, as well as the status distance between them, influences collective performance. Such influences follow some of the patterns I predicted, and I review and elaborate on them below.

Personality Effects for Leader-Second Dyads. There was evidence that differences in personality between leaders and seconds mattered for all three of the personality traits where this type of effect was predicted, but not necessarily in the direction predicted. For extraversion and openness (Hypotheses 1 and 2), the effects were in the predicted direction, with larger differences leading to improved collective performance. For these traits, it is likely that the underlying psychological differences helped the leader and second take on complementary behavioral roles. Differences in agreeableness (Hypothesis 3) also mattered, but the effect was not in the predicted direction; they had negative effect on performance. A possible reason for this is that agreeableness has a more direct impact on the working relationship between leaders and seconds themselves. Unlike extraversion and openness, dissimilarities in agreeableness make social relationships more difficult to maintain (Kamdar & Dyne, 2007; Mount et al., 1998; Neuman et al., 1999). For this reason, leaders and seconds may find it difficult to share leadership with someone who differs from them on a trait that involves compromise and tolerance, and that has been shown to affect social relationships in general (Kamdar & Dyne, 2007; McCrae & Costa, 1989).

These contrasting findings highlight the importance of considering the impact of specific personality traits rather than personality differences overall. It demonstrates that differences in some traits are beneficial, but for other traits they can be harmful. Future research that considers leader-second personality traits needs to articulate a compelling reason why similarities or differences in the particular traits under study are likely to be important. Traits that have both positive and negative effects for leaders, such as narcissism (Watts et al., 2013), are good candidates for incongruence effects. On the other hand, traits where similarity facilitates social cohesion or information exchange, are more likely to produce congruence effect.

It is noteworthy that the effects found for extraversion and openness differ from what has previously been found in the LMX and teams literatures. Two meta-analyses of personality composition in teams have found that differences in these traits do not impact collective performance (Bell, 2007; Peeters et al., 2006). Evidence from the LMX literature points to negative, rather than positive, effects for differences in openness and extraversion (Berneth et al., 2009; Phillips & Bedeian, 1994). The differences between these findings and my own provide corroboration for the argument that leader-second dyads are a unique phenomenon, one that is distinct from either leader-follower dyads or teams in general. These differences also support the claim that further research on the topic is needed to understand how these dyads impact the units they lead.

Unexpectedly, only partial support was found for the proposed main effect of leader-second conscientiousness (Hypothesis 4) and no support was found for the main effect of neuroticism (Hypothesis 5). These results are particularly surprising given the meta-analytic evidence linking these traits to leader effectiveness in teams (Judge et al., 2002). There are several potential explanations for these findings.

One possibility is that earnings calls constitute a strong situation in which executives are expected to display high levels of consciousness and low levels of neuroticism. For example, after a recent earnings call, Wall Street strongly condemned Elon Musk's behavior, and Tesla's stock price sank, after he dismissed one reporter's question as boring and openly admitted to being upset by recent press coverage (Melloy, 2018). If similar behavior had occurred in an internal or routine TMT meeting it is unlikely that it would have been considered particularly unusual or noteworthy. Personality psychologists have long believed that strong situations such as these tend to suppress the effects that individual differences have on behavior (Cooper & Withey, 2009). If this is true, it may be difficult to accurately detect conscientiousness and neuroticism with the behavioral measures I used. This would make for a rather severe and insensitive test of the effects of these personality traits.

However, the problem with this explanation is that assumes that earnings calls constitute a strong situation that places constraints on expressions of conscientiousness and neuroticism, but not on the other three personality traits. It is plausible that financial analysts and others who attend earnings calls place greater emphasis on these two traits because they are closely related to qualities they consider to be particularly important in executives, such as dependability and stability. On the other hand, prior work has found that observers have difficulty accurately assessing at least one of these traits (neuroticism) from language-based cues (Mehl et al., 2006). This makes it less likely that executives would need to suppress the behavioral manifestation of neuroticism in their language.

Future studies of executive personality may need to assess the strength of the relationship between executives' language use and their personality across different contexts. For example, an investigation could be designed to compare the predictive power of executives' language in

company memos versus interviews versus earnings calls. This would help researchers better understand how situational constraints on the expression of executive personality vary across contexts and determine whether some contexts are better than others for assessing particular traits.

An alternative explanation for the lack of support for the main effects of conscientiousness and neuroticism is that there is range restriction in the current sample of firm executive. Those who are high on neuroticism and low on conscientiousness may be less likely to ascend to the top of S&P 1500 companies because of the close links between these traits and leadership. As a result, my sample may consist mainly of leaders and seconds who are near the ends of the spectrums for these traits (high for conscientiousness and low for neuroticism). To explore this possibility I turned to the IBMPI data. In addition to providing raw scores, this service returns percentiles for each individual relative to the others it has analyzed. The median percentile scores in my sample were 81.6 % for conscientiousness and 14.8% for neuroticism. In contrast, the median score for extraversion, which is the trait most strongly linked to leader emergence (Judge et al., 2002), was 52.0%. This difference is likely because, unlike neuroticism or conscientiousness, it is not always beneficial for leaders to be high on extraversion (Grant et al., 2016). These scores lend some credence to the range restriction hypothesis for conscientiousness and neuroticism.

Expertise Effects for Leader-Second Dyads. The failure to find support for the hypothesized benefits of expertise differences (Hypothesis 6) seems to contradict a well-established notion in the literature, as well as meta-analytic evidence showing that TMT functional background diversity improves performance (Certo et al., 2016). This is particularly unexpected given that, as I discussed in Chapter 3, expertise differences were frequently cited by

leaders and seconds as beneficial in my qualitative interviews. There are at least three possible explanations for this non-finding. One is that expertise differences within the dyad are less important than the diversity of expertise within the broader TMT. Functional background diversity in the TMT may compensate for a lack of diversity in the CEO-COO dyad. If this explanation is correct, it provides further evidence that CEO-COO dyads are not simply a paired down version of the TMT. A future study could evaluate the functional backgrounds of the CEO, COO, and the rest of the TMT. It may be that when there is little functional background diversity in the TMT, the differences in the functional backgrounds of the CEO and COO matter more.

There is a second, more mundane, but plausible explanation for these findings. It may be that attempting to determine an executive's dominant functional background using only the prior job titles that were available in the archival data is too unreliable of a measure for an effect to be found. The concern over the inadequacy of the measure emerges from the fact that I am limited to only the job titles a person has had since they became a high-ranking executive. These same concerns are not present for my measures of personality because these are stable traits that are manifest in an executive's contemporaneous behaviors. Similarly, these concerns do not arise for status distance because I am measuring the construct using data from the entire time period of interest. However, my measure of expertise attempts to gauge the accumulation of knowledge and skills over the course of an executive's entire career using data from only a small portion of that career. Because of practical considerations related to how many executives could reasonably be coded by hand in the time available, I had to limit my sample for testing the Hypothesis 6 to the 1847 dyads that were also used to test the personality hypotheses. However, because my measure of expertise does not require text data from transcripts, it is possible, with sufficient time and resources, to obtain a much larger sample from the Execucomp database. This may

increase statistical power enough to overcome the noisiness of this measure and detect any effects that might be present. Subsequent investigations using a larger sample, and accounting for TMT functional background diversity, could determine if either of the above explanations for this non-finding are correct.

A third explanation has to do with my relatively broad conceptualization of expertise, paired with a narrow operationalization. As I discussed in Chapter 4, studies examining overall personality differences produced mixed results, and so it was necessary to pinpoint differences in specific personality traits. Had I only examined overall personality I would not have discovered that differences in agreeableness function differently than differences extraversion or openness. In addition, because differences in these traits have opposite effects, combining them could have resulted in a Type II error. A similar phenomenon may be occurring with expertise. It is possible that different aspects of expertise operate differently. For example, Bunderson and Sutcliffe (2002) found dominant functional background diversity and intrapersonal functional diversity had differential impacts on information sharing and unit performance in management teams. They defined intrapersonal functional diversity as the extent to which team members have broad experience across a range of functions rather than being more narrowly gauged functional specialists. In their study, aggregate intrapersonal functional diversity had a positive effect on information sharing and unit performance. However, dominant functional background diversity had a negative effect. By operationalizing expertise as only dominant functional background, I may have inadvertently overlooked the effects of other types of expertise, such as the breadth of a CEO or COO's functional background, educational background, industry experience, and firm experience. Future studies should differentiated between the different types of expertise and

develop distinct hypothesis for each one before attempting to tease out their different effects empirically (Dragoni, Oh, Vankatwyk, & Tesluk, 2011).

Moderating Mechanism of Status Distance. There was general support for the hypothesis that lower status distance made the effects of leader-second personality differences more positive. However, there was also a positive main effect for status distance on performance. This main effect is consistent with prior research, on co-CEOs and teams, which finds that differences in status and power are beneficial because they create unity of command, alleviate status conflict, and increase helping behaviors (Bunderson et al., 2016; Doyle et al., 2016; Krause et al., 2015). However, the moderating effect suggests that under some conditions, such as when there are differences in certain personality traits, low status distance becomes more beneficial. Additional research is needed to elaborate the conditions under which decreasing status distance in leader-second dyads has a positive effect on performance, and to determine if the negative main effect is fully reversed.

The moderating effect of status distance also hints at the importance of understanding the micro-level processes both within the dyad and between the dyad and followers. It demonstrates that it is not sufficient to examine only the traits of the leader and second, because the effects of these traits can be moderated by the features of the social hierarchy that they operate in and help create. My qualitative data indicated that leaders have a great deal of control over how much status is given to the second, and thus they have a strong influence on the status distance in the dyad. For example, an associate pastor I interviewed [AR2] complained that he lacked status within the church and was unable to accumulate any because his pastor refused to confer it to him. In contrast, an assistant director [AD1] at a non-profit told me that her high status within the organization was a result of explicit efforts by the leader to elevate her. This suggests that leaders

may play a particularly important role in determining the effectiveness of the dyad, even after the dyad is formed. The presence of the status distance moderation means that the fate of the dyad is not predetermined by stable individual differences, such as personality, over which the members of the dyad have little control. This is important because in many organizations, such as the military, leaders do not pick their seconds and as a result, they cannot select for particular traits. More broadly, this finding suggests that promising areas for future research include not only the moderating effects of status distance, but also the search for other structural and process variables that moderate the effects of leader and second traits.

Text Analysis Algorithms. Comparing the three text algorithms, it quickly became apparent that IBMPI, produced the most dependably observable results. There were significant effects for IBMPI on four of five personality traits and significant interactions with status distance. This algorithm also had the highest reliability estimates across contexts and over time (see Tables 4 and 5). The next most reliable measure was LSA, which provided detectable results for all three of the personality difference hypotheses. The least compelling algorithm was PRT, which produced no detectable impacts for any of the five personality hypothesis. It was also the only algorithm to produce a moderation effect that was opposite of the predicted direction. The failure of PRT to produce findings that converged with the other algorithms may be a result of its poor reliability. It had the lowest split-half reliability estimates for all five personality traits, suggesting it was the most error-prone of the algorithms. This pattern of results across algorithms suggests that, when analyzing earnings call transcripts, a closed vocabulary or dictionary based approach (such as PRT) may be a less effective way to measure personality than an open vocabulary approach (such as IBMPI and LSA). The reason for this may be that predefined word categories which are derived from everyday language use are not appropriate in this top

executive and earnings call context. Some words that are commonplace in everyday language are rarely spoken on earnings calls, and the specialized language that appears infrequently in everyday use is commonplace on these calls. For example, Mehl et al. (2006) identified only two LIWC categories that had significant correlations with conscientiousness: swearing and negative emotions. However, because of the norms around earnings calls, words from both of these categories are rarely spoken. In my data, less than 5 percent of all of the speakers on earnings calls ever swore, and only 24 percent ever spoke a word expressing negative emotion. In the top executive and earnings call context, restricting the language analysis to only a predefined list of words and categories eliminates many words that could be linked to conscientiousness, and it creates an overreliance on categories of words that have a very low base rate. It is likely that an effective closed-vocabulary approach could be developed for earnings calls; however, new context-specific data dictionaries would likely need to be developed.

Another open question related to the text analysis is: how many words were needed to accurately measure personality? The cutoff of 300 words in my analysis was primarily based on the minimum number of words needed for IBMPI to return a result. However, to see if this cutoff was sufficient, I performed robustness checks using 500 and 1000 word cutoffs. The results for the personality hypotheses were largely unchanged. I also split the sample into quartiles based on the mean number of words in the dyad and the minimum number of words spoken by either executive. I then compared the split-half reliabilities for each of the quartiles and found no overall pattern indicating that more words provided higher reliability estimates. This would suggest that, at least in the current sample, using a cutoff higher 300 words does not significantly improve the measurement of executive personality.

Theoretical and Methodological Contributions

Scholars reviewing the literature on TMTs have expressed the need for more work that focuses directly on the underlying psychological traits of organizational leaders rather than more easily observable traits that are often used as proxies (Bromiley & Rau, 2016; Hambrick, 2007). Consistent with their call for this type of research, I have used prior literature and qualitative findings to theorize about and directly examine leader-second personality differences. My focus on traits such as personality and expertise also help make this a unique contribution to the pooled leadership literature, which until now has focused on the complementarity of roles rather than of the people in those roles (Denis et al., 2012).

My results contribute to a developing body of evidence that the Q&A portion of earnings calls can be used to gain insights into executives that would be difficult to obtain any other way. My findings can also provide some insight into how best to analyze this type of data. Using multiple text analysis algorithms allows for direct comparisons that might help guide future research which analyzes the language of executives on earnings calls. For example, as I noted above, my findings suggest that open vocabulary approaches (Schwartz et al., 2013) m be preferred, and that 300 spoken words may be sufficient to obtain reliable estimates of personality.

This dissertation also contributes to the relatively small body literature on COOs. It goes beyond the prior literature which only examines the presence or absence of COOs (Hambrick & Cannella, 2004; Marcel, 2009; Zhang, 2006) to consider the joint impact of CEO and COO traits. This approach may provide a path forward for scholars interested in developing new avenues of research around the often overlooked role of the COO. By focusing on the leadership dyad,

scholars can distinguish future work on COOS from existing scholarship on top management teams or on other individual executives.

More broadly, I am making a contribution to the leadership literature by bringing attention to an under-researched leadership role. My findings suggest that when seconds are present they can have a significant impact on leadership effectiveness, and therefore need to be given greater consideration in leadership research. I also find that the leader-second dyad operates differently from the leader-*follower* dyads found in the LMX literature. According to LMX findings, similarity generally leads to higher-quality relationships that improve follower performance (Dulebohn, Wu, & Liao, 2017). However, my findings suggest that in leader-*second* dyads, difference is sometimes more beneficial than similarity. Future LMX research could explore other ways in which these two types of dyads operate differently, and investigate how, together, these dyads impact follower performance. LMX scholars might also want to consider how leader-follower and second-follower relationships interact to influence follower performance. For example, are leader's and second's relationships with followers substitutes for each other or is there an additive effect? The leader-second dyad could also provide new avenues for research in other areas of leadership. For example, is it better to have both the leader and second be transformational leaders or should one of them be transactional (Bass, 1985)? Do seconds play an important role, either as mediators or moderators, in the cascading or trickle-down effects of the ethical features of leaders (Mayer et al., 2009)?

Future Research. The presence of incongruence effects for particular personality traits has implications that go beyond the specific findings of this study. It suggests that the leader-second dyad may be a way for organizational leaders to resolve a key dilemma that seems to be progressively more difficult to navigate. Recent trends in leadership research have increasingly

emphasized the need for leaders to be consistent and authentic (Hoch et al., 2018; Simons et al., 2015). Without these, leaders may be seen as untrustworthy and can lose influence (Avolio & Gardner, 2005; Simons, 2002). On the other hand, a small but growing body of research has also begun to recognize that leaders must manage a variety of paradoxes that are inherent in organizations, which results in seemingly incompatible demands being placed on them (Denison et al., 1995; Zhang et al., 2015). In Chapter 4, I highlighted two of these competing demands (talking versus listening and exploration versus exploitation); however, there are many others as well. For example, leaders must treat followers uniformly but also have individualized relationships, and leaders must be both self-centered and other-centered (Harris, Li, & Kirkman, 2014; Henderson, 2009; Zhang et al., 2015).

To manage these many paradoxes, individual leaders need a broad behavioral repertoire and must sometimes engage in seemingly contradictory talk and actions (Brunsson, 1989; Simons, 2002). Yet, this is at odds with expectations of authenticity and consistency, which tend to narrow the range of behaviors and actions a leader can employ. Authenticity requires the leader to behave in ways that reflect their natural dispositions and internal states, and that resist environmental influences (Avolio et al., 2004; Gardner et al., 2005); and consistency requires words and deeds to be aligned over time and across contexts (Simons, 2002). Individual leaders are therefore faced with the dilemma of needing to employ a wide range of behaviors to meet the demands of their environment, while also needing to limit the breadth of their behaviors to meet the expectations of followers. Leader-second dyads with members who differ on stable traits may be better able to navigate this dilemma. The dyad can maintain a broader behavioral repertoire than either member can alone, while also allowing each member of the dyad to appear consistent and authentic. As the findings for differences in extraversion and openness demonstrate, this is

especially true for traits that can be directly linked to the conflicting demands that leaders face. This suggests that leader-second dyads might also benefit from disparity on other individual differences that are also tied to common organizational tensions. For example, leaders and seconds with different time orientations (Strathman et al., 1994) might be better able to balance the need for both short-term and long-term performance (Wennberg et al., 2011). Similarly, dyads with differing levels of need for affiliation (McClelland, 1961) might excel at simultaneously maintaining both closeness to and distance frooom followers (Zhang et al., 2015). A fruitful avenue for future research might be to identify other individual differences that influence leader-second effectiveness, and to begin to compare the relative strength of their impact. This is essential for understanding which differences leaders and organizations should focus on when forming leader-second dyads.

It is also important to identify which traits, such as I observed with agreeableness, leaders and seconds must share. Traits where differences have a strong impact on relationships and work-related attitudes are likely to be good candidates. For example, in my qualitative data, leaders and seconds regularly emphasized the importance of shared values and beliefs. This was clearly expressed by the senior associate dean [SD1] I interviewed:

> *Our scholarship is actually quite different, but there is a common understanding. Both of us, we have a common set of values that guides what we do here, and we have a common understanding that great researchers are often great teachers. So we don't distinguish between the two, and we have a common view that knowledge creation and knowledge dissemination are two sides of the same coin.*

A key to understanding what makes leader-second dyads effective is identifying which other traits, like certain values and beliefs, must also be shared leaders and seconds.

Another potentially fruitful avenue for future research is to explore interactions between different traits of leaders and seconds. In this study, I considered only the differences between leaders and seconds on the same trait. However, it is possible that certain combinations of leader-second traits have their own effects. Traits that have been shown to have within-person moderating effects could prove particularly promising in this regard. For example, prior research has found that leader narcissism has a positive impact on leader effectiveness when it is (seemingly paradoxically) accompanied by humility (Owens, Wallace, & Waldman, 2015). An interesting question for future research is whether this is also true in leader-second dyads. Is a narcissistic leader more effective when paired with a humble second? What if the second is narcissistic and the leader is humble? This is just one example of the different configurations of leader-second personality traits that can be explored.

Researchers might also want to explore the leader-second dyad's impact on outcomes other than collective performance. As I discussed in Chapter 4, there are a variety of ways to conceptualize leader-second effectiveness, and objective measures of performance are just one of the consequences that organizations are likely to be interested in. For example, how might leader-second dyads affect innovation in the units they lead? Although I did not find a relationship between functional background diversity and collective performance, there could be a stronger connection to innovation. Meta-analytic evidence has previously linked this type of diversity to innovation in teams (Hülsheger et al., 2009). At the firm level, the impact that the presence of a COO has on strategic change has already been examined (Zhang, 2006), but it is likely that the characteristics of the CEO-COO dyad also have an impact. The CEO-COO dyad may also influence other outcomes that are commonly explored in the TMT literature, such as firm diversification.

Other conceptualizations of leader-second effectiveness could consider follower perceptions and work attitudes. As complex as the leader-second relationship is to navigate for the members of the dyad, it may be even more difficult for the followers, especially when there is little status distance in the dyad. When the leader and second are relatively similar in status it can be difficult for followers to know who to go to. In addition, if there is any failure of coordination within the dyad, it can result in conflicting demands being placed on followers. On the other hand, having more than one person providing leadership could allow leaders to provide more personalized attention to followers. In addition, seconds might be able to build closer relationships with followers than a single leader can. Thus, it is unclear whether followers will perceived leader-second dyads as more or less effective than singular leaders, and it is also unclear if the characteristics of the dyad impact these perceptions. Similarly, it remains to be seen whether followers report more or less job satisfaction and engagement when working under leader-second dyads, and whether this depends on the dyad's characteristics.

Limitations

This study has several limitations. First, I only examined leader-second dyads at the top of organizations, despite the presence of these dyads at lower levels as well. When data become available, future research should examine leader-second dyads in smaller groups and teams to see if these pattern of findings hold. The theory developed in this dissertation is intended to be general enough to apply to leader-second dyads at all levels of the organization. However, empirical evidence is needed to evaluate whether leader-second dyads function in the same way regardless of what part of the organization they are in. A notable difference between CEO-COO dyads and leader-second dyads at other organizational levels is the mechanisms through which they are presumed to have their primary impact on collective performance. At the top of the

organization, leaders and seconds effect firm performance primarily through their strategic decision-making (Hambrick, 2007; Hambrick & Mason, 1984). However, at the level of, say, a store manager and assistant manager, leaders and seconds can have a more direct impact on the followers they lead. This could mean that trait differences that improve information sharing and decision-making are far more important at top of organizations than at the lower levels. Conversely, trait differences that affect group processes may become more important in smaller teams. For example, the proposed positive effects of differences in agreeableness (i.e. the good-cop, bad-cop dynamic) might be more likely to emerge in a small groups where leaders and seconds have a great deal of direct contact with the majority of their followers.

A second limitation emerges from my reliance on archival data and indirect measures. As noted above, this might not be sufficient for some constructs, such as expertise. Future studies should complement this one by using more direct measures wherever leaders and seconds who are willing to complete survey assessments can be identified.

A third issue is that I did not test for any mediating mechanism in this study. This means that the mechanisms through which these effects are transmitted are still unknown. Additional research is needed to begin to untangle the mediating mechanisms and better understand the inner workings of the dyad and its influence on followers. A good first step might be to test the mechanisms proposed in Hypotheses 9 and 10 using lab experiements. Small laboratory groups could be used to evaluate leader-second information sharing and paradoxical leader behaviors. Scenario studies could be used to determine if role modeling by leaders and seconds influences followers. Field studies would also be an effective way to evaluate these mediating mechanism. However, this requires researchers to identify an organization or set of organizations where leader-second dyads are common and data can be readily collected from leaders, seconds, and

followers. Military organizations and certain retail firms may provide a good context for such field studies.

In addition to these limitations, a significant concern with the results of this study is the small effect sizes that were observed for personality differences. In most of my analyses, less than one percent of additional variance was explained, which represents a small effect by traditional standards (Cohen, 1992). The reason these effect sizes are so small is largely due to the context in which my hypotheses were tested. The process through which top executive's psychological characteristics alter firm performance has many intervening steps (Hambrick & Mason, 1984). Despite this, executive characteristics can still explain some portion of the variance in firm performance (Hambrick, 2007). However, because their influence on firm performance is indirect, the size of these effects tends to be very small. The amount of variance in firm performance that can be explained by top executives themselves has been the subject of considerable debate; however, it may be as little as 4 to 5 percent (Fitza, 2014). The amount of variance explained by any single trait is even less. A prior study of top executive's personality found that CEO Big Five personality traits explained between 0.6 and 2.1 percent of the variance in firm performance, and that TMT means on those same traits explained between 0.4 and 3 percent of the variance (Colbert, Barrick, & Bradley, 2014). When significant effects were present in my analyses, the addition of the second-in-command explained between 0.3 to 1 percent of the variance in ROA. This means that the second explained half again as much variance as the leader, and, in some cases, nearly as much variance as the entire TMT. If the direction of these effect sizes holds in smaller teams, then I would expect a much higher portion of the variance to be explained by seconds in that context. Meta-analytic evidence finds that as much as 9 percent of the variance in team performance can be explained by a single leader

personality trait (Judge et al., 2002), which means that additional of the second's personality trait might explain as much as 4.5 percent of the variance in team performance (where a second role exists).

Overall, the effect sizes I found are similar to those found in other TMT research (c.f. Certo et al., 2006). Those who investigate the upper echelons have long accepted these small effect sizes because they can still be of practical significance when the outcome is firm performance. Even small contributions to variance explained can translate into many millions of dollars of losses or gains for a firm (Dalton, Daily, Certo, & Roengpitya, 2003). So, although my effect sizes were small, this is not necessarily grounds for dismissing their importance.

Finally, the poor correlations between personality scores resulting from the different algorithms raises significant concerns about the construct validity of these measures. The split-half reliability estimate and correlations between scores for executives who switch companies indicate that these algorithms are tapping into relatively stable patterns in executive speech. However, it is less clear that they are all tapping into the same personality traits. Part of the problem is that the algorithms produce a large amount of random error variance. Studies comparing the results of these algorithms to self-reported big five measures generally produced correlations between $r = 0.2$ and $r = 0.3$ (Kwantes et al., 2016; Mairesse et al., 2007; Schwartz et al., 2013). This corresponds to some of the poor correlations between algorithms that I've observed here. The large sample size in my archival study allowed me to overcome this issue and detect the effects of leader and second personality despite the noisiness of the measures.

It is also possible that, in addition to random error, the different algorithms are tapping into different facets of the big five traits. However, the most concerning potential explanation for

the low correlations between algorithms is that they have difficulty accurately measuring personality in the context of earnings calls. The three algorithms were all developed using language from commonplace or lower stakes contexts, such as, discussions in laboratory settings, recordings of everyday conversation, and written essays. Earnings calls typically involve specialized and often technical language, which is sometimes used to obfuscate rather than illuminate (Pope & Zhao, 2017). This means that algorithms developed for use with colloquial language might not be effective when applied to the language used in earnings calls, even when it is limited to the spontaneous utterances found in the Q&A section. Additional studies are needed to validate the use of these algorithms in an earnings call setting. These studies should compare the scores produced from the language used in earnings calls to either self-reports or other-reports of executive personality.

Conclusion

Throughout this dissertation, I have argued that seconds-in-command in general, and leader-second dyads specifically, are a phenomenon that warrants additional research attention. The studies I present here represent a first step toward developing an understanding of how these dyads operate and how they impact their followers and the broader organizations within which they are embedded. However, much more work is needed. Given the increasing scope and complexity of leadership in modern organizations, it is likely that the prevalence of leader-second dyads will increase. There are already signs that seconds are becoming more common at the top of organizations (Bhardwaj, Eisingerich, & Täube, 2011). Despite this, organizational researchers can currently offer little guidance as to who these seconds should be or what the architecture of the relationship between the leader and second should look like. The differences between the findings presented here and those in the LMX, teams, and TMT literature, suggests

leader-second dyads are a unique phenomenon and that organizational scholars cannot assume that knowledge built in other contexts can be applied to them. A new body of knowledge needs to be developed around this critical leadership dyad. It is my hope that this dissertation will help begin a broader conversation about seconds, and entice a few other scholars to explore this topic in future research.

Table 1: List of Leader Interviewees

Job Title	Code	Type of Organization	Unit Size	Gender
Principal	PRI1	Education	450	Female
Branch Manager	BMA1	For-Profit	22	Female
Store Manager	SMA1	For-Profit	20	Male
Co-Founder & CEO	CEO1	For-Profit	21	Male
Attorney	ATT1	For-Profit	4	Female
Commanding Officer	COF1	Military	1000	Male
Commanding Officer	COF2	Military	400	Male
Director	DIR1	Non-Profit	150	Male
Pastor	PAS1	Religious	250	Female
Pastor	PAS2	Religious	200	Male
Head Coach	HCO1	Sports	12	Male

Table 2: List of Second Interviewees

Job Title	Code	Type of Organization	Unit Size	Gender
Vice Chair	VC1	Community Organization	17	Female
Assistant Principal	AP1	Education	450	Female
Assistant Principal	AP2	Education	825	Female
Provost	P1	Education	60,000	Male
Provost	P2	Education	55,000	Male
Senior Associate Dean	SD1	Education	13,000	Male
Assistant Branch Manager	AM1	For-Profit	22	Female
Assistant Manager	AM2	For-Profit	30	Female
Assistant Manager	AM3	For-Profit	16	Female
Assistant Store Manager	AM4	For-Profit	20	Male
Chief Operating Officer	CO1	For-Profit	90	Male
Co-Founder & COO	CO2	For-Profit	21	Male
Office Manager	OM1	For-Profit	4	Female
Senior Vice President	VP1	For-Profit	1,500	Male
Vice President	VP2	For-Profit	130	Male
Assistant Fire Chief	FC1	Government	1,200	Male
Chief of Staff	CS1	Government	10	Female
Director of Operations	XO1	Military	1000	Male
Executive Officer	XO2	Military	1000	Male
Executive Officer	XO3	Military	400	Male
Executive Officer	XO4	Military	600	Male
Executive Officer	XO5	Military	500	Male
Assistant Director	AD1	Non-Profit	150	Female
Chief Operating Officer	CO3	Non-Profit	6	Female
Senior Director	SD1	Non-Profit	45	Male
Associate Pastor	AR1	Religious	250	Female
Associate Rector	AR2	Religious	200	Male
Associate Pastor	AR3	Religious	200	Male
Executive Pastor	AR4	Religious	500	Female
Lay Leader	LL1	Religious	300	Male
Assistant Coach	AC1	Sports	15	Male
Assistant Coach	AC2	Sports	12	Male
Assistant Coach	AC3	Sports	35	Female
Assistant Head Coach	AC4	Sports	40	Male
Associate Head Coach	AC5	Sports	10	Male
Associate Head Coach	AC6	Sports	12	Male

Table 3: Correlations Between Text Analysis Algorithms

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. PRT Extraversion														
2. IBMPI Extraversion	**.064****													
3. LSA Extraversion	**.031**	**-.064****												
4. PRT Openness	-.131**	.044**	-.008											
5. IBMPI Openness	-.165**	.119**	-.038*	**.142****										
6. LSA Openness	-.020	-.220**	.418**	**.101****	**.001**									
7. PRT Agreeableness	.452**	.083**	.014	-.120**	-.144**	.133**								
8. IBMPI Agreeableness	.328**	.155**	.280**	-.092**	-.175**	.046**	**.170****							
9. LSA Agreeableness	.106**	-.069**	.173**	.019	.040*	.047**	**.013**	**.298****						
10. PRT Conscientiousness	.608**	.046**	.007	.380**	-.037*	.052**	.315**	.126**	.026					
11. IBMPI Conscientiousness	.219**	.139**	.324**	-.076**	-.183**	.016	.111**	.540**	.022	**.073****				
12. LSA Conscientiousness	.054**	.263**	-.035*	.044**	.144**	-.228**	-.018	.114**	.201**	**.044****	**.119****			
13. PRT Neuroticism	.173**	-.097**	.075**	.071**	-.017	-.012	-.105**	.037*	.047**	.355**	-.030	-.045**		
14. IBMPI Neuroticism	-.009	.244**	.123**	.059**	-.138**	.122**	.025	-.020	-.253**	.033*	.527**	-.162**	**-.061****	
15. LSA Neuroticism	-.053**	.089**	-.030	.028	-.054**	-.178**	.009	-.066**	.107**	-.013	-.044**	-.052**	**.112****	**-.013**

N = 3694
*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).
Correlations between algorithms measuring the same trait are bolded

Table 4: Split Half Reliabilities

	Personality Recognizer Tool	IBM Personality Insights	Latent Semantic Analysis
Extraversion	.602**	.759**	.738**
Openness	.502**	.736**	.772**
Agreeableness	.592**	.679**	.646**
Conscientiousness	.501**	.674**	.698**
Neuroticism	.447**	.801**	.612**

N = 500

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5: Correlations for Executives Who Changed Companies

	Personality Recognizer Tool	IBM Personality Insights	Latent Semantic Analysis
Extraversion	.403**	.525**	.439**
Openness	.338**	.503**	.606**
Agreeableness	.422**	.544**	.450**
Conscientiousness	.415**	.512**	.232**
Neuroticism	.357**	.517**	.311**

N = 331

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6: Descriptive Statistics and Correlations

	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Leader PRT Extraversion	.807	.141																	
2. Leader IBMPI Extraversion	.054	.018	.103**																
3. Leader LSA Extraversion	.034	.039	.089**	-.068**															
4. Leader PRT Openness	.717	.156	-.131**	.035	-.008														
5. Leader IBMPI Openness	.316	.009	-.299**	.085**	-.025	.245**													
6. Leader LSA Openness	.085	.041	-.036	-.170**	.452**	.136**	.013												
7. Leader PRT Agreeableness	.654	.094	.452**	.137**	-.018	-.120**	-.274**	.152**											
8. Leader IBMPI Agreeableness	.198	.019	.577**	.156**	.292**	-.177**	-.191**	.087**	.286**										
9. Leader LSA Agreeableness	.074	.036	.183**	-.091**	.184**	.052*	.033	.069**	-.007	.313**									
10. Leader PRT Conscientiousness	.913	.180	.608**	.032	.030	.380**	-.076**	.094**	.315**	.238**	.079**								
11. Leader IBMPI Conscientiousness	.170	.017	.362**	.189**	.334**	-.094**	-.175**	.041	.158**	.548**	.003	.133**							
12. Leader LSA Conscientiousness	.144	.042	.075**	.279**	-.057*	.067**	.168**	-.212**	.022	.065**	.200**	.078**	.073**						
13. Leader PRT Neuroticism	.084	.153	.173**	-.212**	.118**	.071**	.003	.022	-.105**	.095**	.105**	.355**	-.022	-.098**					
14. Leader IBMPI Neuroticism	.026	.016	-.039	.303**	.134**	.118**	-.111**	.105**	.000	.012	-.262**	.033	.576**	-.135**	-.090**				
15. Leader LSA Neuroticism	.006	.022	-.113**	.044	-.012	.083**	-.033	-.110**	-.038	-.105**	.135**	-.040	-.088**	-.063**	.171**	-.037			
16. Second PRT Extraversion	.751	.172	.165**	.020	.028	-.056*	-.031	-.014	.075**	.135**	.098**	.056*	.105**	.083**	-.031	.001	-.056*		
17. Second IBMPI Extraversion	.056	.021	.031	.334**	-.082**	.052*	.022	-.099**	.038	.047*	.004	.059*	-.014	.155**	.000	.044	.041	.038	
18. Second LSA Extraversion	.024	.043	-.022	-.043	.458**	-.008	-.026	.220**	.044	.075**	.035	-.014	.147**	-.033	.038	.105**	-.002	.040	-.046*
19. Second PRT Openness	.676	.147	-.046*	.013	.050*	.140**	.039	.036	-.053*	.013	-.027	-.007	.042	.018	.019	.055*	-.015	-.213**	.039
20. Second IBMPI Openness	.317	.011	-.052*	-.033	-.084**	.056*	.196**	-.052*	-.034	-.052*	-.047*	-.004	-.069**	.043	-.034	-.069**	-.060**	-.261**	.138**
21. Second LSA Openness	.083	.048	-.006	-.053*	.253**	.071**	-.049*	.462**	.118**	.123**	.097**	.016	.110**	-.064**	-.041	.083**	-.054*	-.061**	-.254**
22. Second PRT Agreeableness	.657	.114	.084**	.023	.023	-.031	-.041	.113**	.195**	.083**	.049*	.065**	.060*	-.031	-.001	.040	.007	.374**	.033
23. Second IBMPI Agreeableness	.189	.019	.094**	.102**	.142**	-.011	-.030	.064**	.062**	.269**	.158**	.020	.137**	.108**	-.019	.006	-.050*	.500**	.198**
24. Second LSA Agreeableness	.065	.039	.036	-.002	.050*	-.012	-.039	.015	.031	.079**	.280**	-.023	.015	.038	-.006	-.057*	-.006	.095**	-.038
25. Second PRT Conscientiousness	.801	.211	.118**	.008	.024	-.027	-.023	.006	.058*	.101**	.067**	.068**	.090**	.053*	.005	.022	-.040	.650**	-.036
26. Second IBMPI Conscientiousness	.165	.018	.083**	.039	.192**	-.061**	-.065**	.032	.068**	.154**	.064**	.015	.282**	.093**	-.038	.169**	-.049*	.319**	.120**
27. Second LSA Conscientiousness	.146	.045	.036	.100**	-.042	.023	.078**	-.119**	-.054*	.064**	.037	.013	.052*	.375**	.004	-.008	-.070**	.097**	.249**
28. Second PRT Neuroticism	-.008	.185	.035	-.052*	.050*	-.038	-.012	.019	-.014	.043	.036	.003	.008	.005	.164**	-.046*	.043	.086**	-.213**
29. Second IBMPI Neuroticism	.025	.018	.019	.111**	.137**	.006	-.092**	.084**	.048*	.036	-.033	.033	.196**	-.035	-.034	.307**	.010	-.132**	.204**
30. Second LSA Neuroticism	.004	.025	-.003	.061**	-.010	-.019	-.042	-.081**	.049*	-.032	-.039	.010	-.045	-.021	.062**	-.001	.334**	-.120**	.127**
31. Firm Prior Performance	.146	.116	.029	-.056*	.067**	-.069**	-.096**	-.005	.018	-.038	-.087**	.008	.018	-.064**	.027	-.011	.015	.045	-.071**
32. Prior Industry Performance	.096	.049	.049*	-.041	.105**	-.083**	-.074**	.026	.094**	-.009	-.016	.015	.125**	-.030	.003	.090**	.055*	.026	-.088**
33. Firm Size	7.864	1.561	.060**	.058*	.043	.024	-.023	.017	.053*	-.008	.081**	.077**	-.045	.149**	.166**	-.006	.080**	.023	.134**
34. TMT Size	6.014	1.153	.031	.003	.047*	-.043	.012	-.032	-.014	.039	.007	-.022	.047*	.062**	.042	.019	.021	.044	-.007
35. Dyad Duration	2.994	2.347	.005	-.047*	.019	.070**	-.046*	.058*	-.032	-.004	-.003	.063**	-.012	-.103**	.074**	.031	.019	-.068**	-.034
36. Heir Apparent	.426	.495	-.012	.072**	-.043	.025	.033	.008	.074**	-.069**	-.075**	.016	-.053*	.009	-.073**	.018	.014	-.041	.001
37. Status Distance	.000	1.000	-.023	-.021	.088**	-.023	-.031	.000	-.108**	.040	.078**	-.035	.036	-.047*	.056*	.036	.046*	.013	.022
38. ROA	.137	.097	.055*	-.072**	.087**	-.088**	-.118**	-.041	.022	-.002	-.045	.023	.065**	-.055*	.031	.020	.023	.034	-.048*

N = 1847
*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1. Leader PRT Extraversion																				
2. Leader IBMPI Extraversion																				
3. Leader LSA Extraversion																				
4. Leader PRT Openness																				
5. Leader IBMPI Openness																				
6. Leader LSA Openness																				
7. Leader PRT Agreeableness																				
8. Leader IBMPI Agreeableness																				
9. Leader LSA Agreeableness																				
10. Leader PRT Conscientiousness																				
11. Leader IBMPI Conscientiousness																				
12. Leader LSA Conscientiousness																				
13. Leader PRT Neuroticism																				
14. Leader IBMPI Neuroticism																				
15. Leader LSA Neuroticism																				
16. Second PRT Extraversion																				
17. Second IBMPI Extraversion																				
18. Second LSA Extraversion																				
19. Second PRT Openness	.036																			
20. Second IBMPI Openness	-.035	.251**																		
21. Second LSA Openness	.392**	.126**	-.005																	
22. Second PRT Agreeableness	.030	-.143**	-.258**	.130**																
23. Second IBMPI Agreeableness	.228**	-.081**	-.144**	.000	.218**															
24. Second LSA Agreeableness	.139**	.057*	.060**	.024	-.051*	.248**														
25. Second PRT Conscientiousness	.032	.093**	-.150**	.064**	.379**	.288**	.022													
26. Second IBMPI Conscientiousness	.291**	-.048*	-.178**	-.014	.144**	.503**	.007	.236**												
27. Second LSA Conscientiousness	-.011	.052*	.123**	-.240**	-.040	.180**	.211**	.063**	.170**											
28. Second PRT Neuroticism	.050*	-.071**	-.094**	.087**	.051*	.077**	.020	.351**	.060*	-.083**										
29. Second IBMPI Neuroticism	.109**	.125**	-.156**	.133**	-.002	-.067**	-.256**	.057*	.488**	-.183**	.027									
30. Second LSA Neuroticism	-.055*	.015	-.065**	-.231**	-.054*	-.058*	.077**	-.131**	-.021	-.041	.065**	.003								
31. Firm Prior Performance	.108**	-.030	-.063**	-.041	.003	.034	-.002	-.022	.087**	-.025	-.038	-.020	.038							
32. Prior Industry Performance	.101**	-.041	-.076**	.018	.081**	-.043	-.008	.025	.116**	-.007	-.013	.021	.035	.212**						
33. Firm Size	.026	.050*	-.051*	-.040	.050*	.020	.065**	.077**	.036	.136**	.141**	.031	.150**	.005	.129**					
34. TMT Size	.056*	.005	-.042	-.035	-.033	.034	.024	.035	.051*	.012	.065**	.009	.025	.018	-.015	.091**				
35. Dyad Duration	-.002	.061**	.022	.068**	-.044	-.049*	-.033	-.029	-.015	-.063**	-.004	.055*	-.028	.025	.025	-.116**	-.149**			
36. Heir Apparent	.049*	-.024	-.006	-.013	-.002	-.003	-.001	-.067**	.013	.003	.011	-.008	.059*	.046*	-.024	.007	.019	.078**		
37. Status Distance	.023	-.031	-.016	.008	-.028	.017	.028	.006	.004	.022	-.015	-.001	.022	.045	.021	.043	-.038	.030	-.029	
38. ROA	.169**	-.016	-.086**	-.032	.021	.037	-.026	.006	.127**	-.024	-.037	.021	.021	.663**	.320**	.011	-.041	.029	-.004	.076**

N = 1847
*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table 7: Regression of ROA on Controls

Variable	b (se)
Constant	.052** (.013)
Firm Prior Performance	.523** (.014)
Industry Prior Performance	.369** (.034)
Firm Size	-.001 (.001)
TMT Size	-.004** (.001)
Dyad Duration	.000 (.001)
Heir Apparent	.005 (.003)
R-squared	.477

N = 1847. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table 8: Regressions of ROA on Extraversion

	Personality Recognizer		Watson Personality Insights		Latent Semantic Analysis	
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	.037* (.015)	.090 (.046)	.060** (.014)	.048** (.018)	.052** (.013)	.049** (.013)
Firm Prior Performance	.523** (.014)	.522** (.015)	.522** (.014)	.523** (.014)	.522** (.014)	.512** (.014)
Industry Prior Performance	.367** (.034)	.367** (.034)	.368** (.034)	.370** (.034)	.364** (.034)	.358** (.034)
Firm Size	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)
TMT Size	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)
Dyad Duration	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)
Heir Apparent	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.007* (.003)
Leader Extraversion	.020 (.012)	-.046 (.088)	-.143 (.092)	.096 (.388)	.067 (.042)	-.153 (.083)
Second Extraversion		-.071 (.049)		.192 (.328)		.158* (.065)
Leader Extraversion Squared		-.003 (.052)		-1.703 (3.783)		1.830* (.861)
Leader × Second Extraversion		.098 (.071)		-1.811 (4.909)		-1.587 (1.180)
Second Extraversion Squared		-.004 (.016)		.232 (2.617)		1.425* (.639)
R-squared	.478	.479	.478	.479	.478	.488

N = 1847. Standard errors in parentheses.

* Significant at the 0.05 level (2-tailed).

** Significant at the 0.01 level (2-tailed).

Table 9: Extraversion Surface Tests

	Personality Recognizer	Watson Personality Insights	Latent Semantic Analysis
a 1	-0.12	0.29	0.004
a 2	0.09	-3.28	1.67
a 3	0.03	-0.10	-0.31**
a 4	-0.11	0.34	4.84*

Table 10: Regressions of ROA on Openness

	Personality Recognizer		Watson Personality Insights		Latent Semantic Analysis	
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	.066** (.015)	-.023 (.045)	.194** (.058)	-3.095 (1.910)	.061** (.013)	.061** (.014)
Firm Prior Performance	.522** (.014)	.523** (.014)	.520** (.014)	.518** (.015)	.523** (.014)	.519** (.015)
Industry Prior Performance	.364** (.034)	.364** (.034)	.365** (.034)	.359** (.034)	.371** (.034)	.371** (.034)
Firm Size	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	.000 (.001)
TMT Size	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)
Dyad Duration	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)
Heir Apparent	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)
Leader Openness	-.019 (.011)	.021 (.085)	-.446* (.176)	20.629* (8.620)	-.104** (.040)	-.226 (.130)
Second Openness		.221** (.074)		.037 (6.391)		-.038 (.102)
Leader Openness Squared		.044 (.050)		-12.097 (12.095)		1.485 (.806)
Leader × Second Openness		-.160* (.071)		-42.295* (16.421)		-1.852 (1.026)
Second Openness Squared		-.070 (.040)		20.550* (8.123)		1.326* (.595)
R-squared	.478	.481	.478	.483	.479	.481

N = 1847. Standard errors in parentheses.

* Significant at the 0.05 level (2-tailed).

** Significant at the 0.01 level (2-tailed).

Table 11: Openness Surface Tests

	Personality Recognizer	Watson Personality Insights	Latent Semantic Analysis
a 1	0.24	20.67	-0.27
a 2	-0.19*	-33.84	0.96
a 3	-0.20*	20.59*	-0.19
a 4	0.13	50.75*	4.66*

Table 12: Regressions of ROA on Agreeableness

	Personality Recognizer		Watson Personality Insights		Latent Semantic Analysis	
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	.055** (.017)	.159* (.076)	.030 (.021)	-.254 (.174)	.050** (.013)	.059** (.014)
Firm Prior Performance	.523** (.014)	.523** (.014)	.524** (.014)	.523** (.014)	.524** (.015)	.523** (.014)
Industry Prior Performance	.370** (.034)	.368** (.034)	.369** (.034)	.367** (.034)	.370** (.034)	.367** (.034)
Firm Size	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)
TMT Size	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)
Dyad Duration	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)
Heir Apparent	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)
Leader Agreeableness	-.005 (.017)	-.158 (.149)	.116 (.084)	2.502* (1.185)	.034 (.046)	.097 (.140)
Second Agreeableness		-.165 (.123)		.433 (1.227)		-.220 (.121)
Leader Agreeableness Squared		-.041 (.109)		-8.151** (2.783)		-1.885* (.862)
Leader × Second Agreeableness		.313 (.180)		4.491 (4.457)		3.690** (1.161)
Second Agreeableness Squared		-.028 (.037)		-3.207 (2.968)		-.879 (.709)
R-squared	.477	.478	.478	.481	.477	.482

N = 1847. Standard errors in parentheses.

* Significant at the 0.05 level (2-tailed).

** Significant at the 0.01 level (2-tailed).

Table 13: Agreeableness Surface Tests

	Personality Recognizer	Watson Personality Insights	Latent Semantic Analysis
a 1	-0.32	2.94	-0.12
a 2	0.25	-6.87	0.93
a 3	0.01	2.07	0.32
a 4	-0.38	-15.85*	-6.45**

Table 14: Regressions of ROA on Conscientiousness

	Personality Recognizer			Watson Personality Insights			Latent Semantic Analysis		
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	.045** (.015)	.027 (.037)	.041** (.015)	.023 (.020)	.488** (.169)	-.008 (.023)	.053** (.014)	.038 (.022)	.054** (.014)
Firm Prior Performance	.523** (.014)	.523** (.014)	.523** (.014)	.523** (.014)	.514** (.014)	.521** (.014)	.523** (.014)	.523** (.014)	.523** (.014)
Industry Prior Performance	.369** (.034)	.368** (.034)	.369** (.034)	.361** (.035)	.353** (.034)	.353** (.035)	.369** (.034)	.371** (.034)	.369** (.034)
Firm Size	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)
TMT Size	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)
Dyad Duration	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)
Heir Apparent	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.006 (.003)	.005 (.003)
Average Conscientiousness			.014 (.011)			.373** (.117)			-.015 (.046)
Leader Conscientiousness	.008 (.009)	.047 (.058)		.175 (.094)	-1.795 (1.361)		-.011 (.040)	.238 (.192)	
Second Conscientiousness		.002 (.041)			-3.761** (1.199)			-.026 (.170)	
Leader Conscientiousness Squared		-.030 (.030)			-4.895 (3.592)			-1.346 (.693)	
Leader × Second Conscientiousness		.017 (.044)			21.417** (5.669)			1.058 (1.005)	
Second Conscientiousness Squared		-.009 (.011)			1.202 (3.340)			-.436 (.573)	
R-squared	.477	.478	.478	.478	.485	.480	.477	.478	.477

N = 1847. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table 15: Conscientiousness Surface Tests

	Personality Recognizer	Watson Personality Insights	Latent Semantic Analysis
a 1	0.05	-5.56**	0.21
a 2	-0.02	17.73**	-0.72
a 3	0.04	1.97	0.26
a 4	-0.06	-25.11**	-2.84

Table 16: Regressions of ROA on Neuroticism

	Personality Recognizer			Watson Personality Insights			Latent Semantic Analysis		
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Constant	.053** (.013)	.053** (.013)	.053** (.013)	.050** (.013)	.055** (.013)	.048** (.013)	.052** (.013)	.053** (.013)	.052** (.013)
Firm Prior Performance	.523** (.014)	.522** (.015)	.523** (.014)	.523** (.014)	.523** (.014)	.524** (.014)	.523** (.014)	.523** (.014)	.523** (.014)
Industry Prior Performance	.370** (.034)	.367** (.034)	.370** (.034)	.367** (.034)	.374** (.034)	.366** (.034)	.369** (.034)	.367** (.035)	.369** (.034)
Firm Size	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)	-.001 (.001)
TMT Size	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)	-.004** (.001)
Dyad Duration	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)	.000 (.001)
Heir Apparent	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)	.005 (.003)
Average Neuroticism			.004 (.013)			.186 (.119)			.003 (.086)
Leader Neuroticism	.011 (.011)	.013 (.014)		.069 (.102)	-.051 (.250)		.027 (.076)	.064 (.086)	
Second Neuroticism		.003 (.011)			-.189 (.205)			-.027 (.072)	
Leader Neuroticism Squared		-.011 (.041)			-8.649 (4.437)			-1.990 (2.557)	
Leader × Second Neuroticism		-.084 (.063)			19.929** (6.132)			-.039 (3.155)	
Second Neuroticism Squared		.023 (.027)			-3.873 (3.038)			.028 (1.690)	
R-squared	.477	.478	.477	.477	.481	.478	.477	.477	.477

N = 1847. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table 17: Neuroticism Surface Tests

	Personality Recognizer	Watson Personality Insights	Latent Semantic Analysis
a 1	0.02	-0.24	0.04
a 2	-0.07	7.41	-2.00
a 3	0.01	0.14	0.09
a 4	0.10	-32.45**	-1.92

Table 18: ROA by Functional Background Difference, Including the General Management Category

Variable	F
Constant	17.70**
Firm Prior Performance	1305.93**
Industry Prior Performance	117.67**
Firm Size	0.37
TMT Size	7.45**
Dyad Duration	0.01
Heir Apparent	2.40
Functional Background Difference	0.93
R-squared	.478

N = 1847. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table 19: ROA by Functional Background Difference, Excluding the General Management Category

Variable	F
Constant	7.16**
Firm Prior Performance	615.49**
Industry Prior Performance	65.31**
Firm Size	3.49
TMT Size	3.25
Dyad Duration	0.05
Heir Apparent	2.77
Functional Background Difference	0.24
R-squared	.617

N = 532. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table 20: Moderation of the Effects of Extraversion on ROA by Status Distance

Variable	Extraversion		
	Personality Recognizer	Watson Personality Insights	Latent Semantic Analysis
Constant	.089 (.047)	.049** (.018)	.050** (.013)
Firm Prior Performance	.517** (.015)	.520** (.014)	.510** (.014)
Industry Prior Performance	.373** (.034)	.370** (.034)	.358** (.034)
Firm Size	-.001 (.001)	-.001 (.001)	-.001 (.001)
TMT Size	-.004** (.001)	-.004** (.001)	-.004** (.001)
Dyad Duration	.000 (.001)	.000 (.001)	.000 (.001)
Heir Apparent	.005 (.003)	.005 (.003)	.006 (.003)
Leader Trait	-.046 (.089)	.024 (.404)	-.163 (.084)
Second Trait	-.065 (.051)	.240 (.329)	.164* (.065)
Leader Trait Squared	-.005 (.052)	-.048 (3.983)	1.914* (.888)
Leader × Second Trait	.103 (.071)	-3.956 (5.129)	-1.639 (1.197)
Second Trait Squared	-.013 (.017)	.839 (2.669)	1.389* (.653)
Status Distance	-.009 (.057)	-.019 (.016)	.005 (.003)
Status Distance x Leader Trait	-.069 (.115)	.407 (.458)	-.024 (.092)
Status Distance x Second Trait	.109 (.057)	.414 (.353)	.032 (.076)
Status Distance x Leader Trait Squared	.088 (.066)	-4.285 (4.007)	-.158 (.827)
Status Distance x Leader x Second Trait	-.125 (.083)	2.143 (3.890)	-.036 (1.228)
Status Distance x Second Trait Squared	.009 (.020)	-4.021 (2.396)	-.053 (.632)
ΔR-squared	.005**	.004*	.001

N = 1847. Standard errors in parentheses.

* Significant at the 0.05 level (2-tailed).

** Significant at the 0.01 level (2-tailed).

Table 21: Moderation of the Effects of Openness on ROA by Status Distance

Variable	Openness		
	Personality Recognizer	Watson Personality Insights	Latent Semantic Analysis
Constant	-.017 (.046)	-3.453 (1.926)	.063** (.014)
Firm Prior Performance	.521** (.014)	.515** (.015)	.518** (.015)
Industry Prior Performance	.361** (.034)	.366** (.034)	.371** (.034)
Firm Size	-.001 (.001)	-.001 (.001)	-.001 (.001)
TMT Size	-.004** (.001)	-.004** (.001)	-.004** (.001)
Dyad Duration	.000 (.001)	.000 (.001)	.000 (.001)
Heir Apparent	.005 (.003)	.005 (.003)	.005 (.003)
Leader Trait	.029 (.086)	23.220** (8.746)	-.264 (.135)
Second Trait	.191* (.076)	-.327 (6.382)	-.031 (.102)
Leader Trait Squared	.053 (.051)	-14.259 (12.208)	1.635* (.832)
Leader × Second Trait	-.189** (.072)	-45.983**(16.879)	-1.745 (1.044)
Second Trait Squared	-.032 (.044)	22.955** (8.321)	1.220* (.603)
Status Distance	.063 (.051)	.904 (1.977)	.007 (.006)
Status Distance x Leader Trait	-.204 (.109)	-14.016 (8.861)	.144 (.104)
Status Distance x Second Trait	.048 (.082)	8.496 (7.711)	-.134 (.114)
Status Distance x Leader Trait Squared	.118 (.071)	15.264 (14.255)	-1.273 (.691)
Status Distance x Leader x Second Trait	.073 (.080)	14.236 (17.002)	.533 (.914)
Status Distance x Second Trait Squared	-.093* (.047)	-21.039* (8.533)	.390 (.581)
ΔR-squared	.006**	.005*	.003

N = 1847. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table 22: Moderation of the Effects of Agreeableness on ROA by Status Distance

Variable	Agreeableness		
	Personality Recognizer	Watson Personality Insights	Latent Semantic Analysis
Constant	.173* (.079)	-.239 (.175)	.061** (.014)
Firm Prior Performance	.520** (.014)	.518** (.015)	.521** (.015)
Industry Prior Performance	.372** (.034)	.371** (.035)	.365** (.034)
Firm Size	-.001 (.001)	-.001 (.001)	-.001 (.001)
TMT Size	-.004** (.001)	-.004** (.001)	-.004** (.001)
Dyad Duration	.000 (.001)	.000 (.001)	.000 (.001)
Heir Apparent	.005 (.003)	.005 (.003)	.005 (.003)
Leader Trait	-.131 (.154)	2.382* (1.209)	.078 (.142)
Second Trait	-.233 (.127)	.420 (1.243)	-.252* (.122)
Leader Trait Squared	-.062 (.111)	-8.145** (2.860)	-1.890* (.897)
Leader × Second Trait	.326 (.180)	5.191 (4.462)	3.777** (1.187)
Second Trait Squared	.013 (.041)	-3.530 (3.019)	-.731 (.714)
Status Distance	.045 (.076)	-.042 (.213)	.019* (.009)
Status Distance x Leader Trait	-.102 (.178)	.425 (1.323)	-.166 (.161)
Status Distance x Second Trait	-.027 (.126)	.289 (1.299)	-.335* (.148)
Status Distance x Leader Trait Squared	-.063 (.148)	-.839 (2.723)	.174 (.812)
Status Distance x Leader x Second Trait	.247 (.189)	-1.608 (5.351)	2.739 (1.412)
Status Distance x Second Trait Squared	-.083 (.044)	.044 (2.872)	.654 (.823)
ΔR-squared	.004*	.004*	.003

N = 1847. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table 23: Moderation of the Effects of Functional Background Difference on ROA by Status Distance, Including the General Management Category

Variable	Model 1	Model 2
Constant	18.40**	18.48**
Firm Prior Performance	1299.68**	1298.81**
Industry Prior Performance	117.61**	117.66**
Firm Size	0.55	0.58
TMT Size	7.02**	7.09**
Dyad Duration	0.002	0.002
Heir Apparent	2.20	2.21
Functional Background Difference	0.70	0.76
Status Difference	5.67*	2.52
Status Difference x Functional Background Difference		0.29
R-squared	.479	.479

N = 1847. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table 24: Moderation of the Effects of Functional Background Difference on ROA by Status Distance, Excluding the General Management Category

Variable	Model 1	Model 2
Constant	7.69**	7.59**
Firm Prior Performance	610.12**	609.16**
Industry Prior Performance	66.21**	65.92**
Firm Size	3.95*	3.92*
TMT Size	3.15	3.12
Dyad Duration	0.07	0.06
Heir Apparent	2.74	2.73
Functional Background Difference	0.11	0.14
Status Difference	2.60	2.43
Status Difference x Functional Background Difference		0.12
R-squared	.619	.619

N = 532. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Table 25: Regression of Status Distance on ROA

Variable	b (se)
Constant	.053** (.013)
Firm Prior Performance	.521** (.014)
Industry Prior Performance	.369** (.034)
Firm Size	-.001 (.001)
TMT Size	-.004** (.001)
Dyad Duration	.000 (.001)
Heir Apparent	.005 (.003)
Status Distance	.004* (.002)
R-squared	.479

N = 1847. Standard errors in parentheses.
* Significant at the 0.05 level (2-tailed).
** Significant at the 0.01 level (2-tailed).

Figure 1: Effects of Leader-Second Dyad Traits on Collective Performance, Moderated by Status Distance

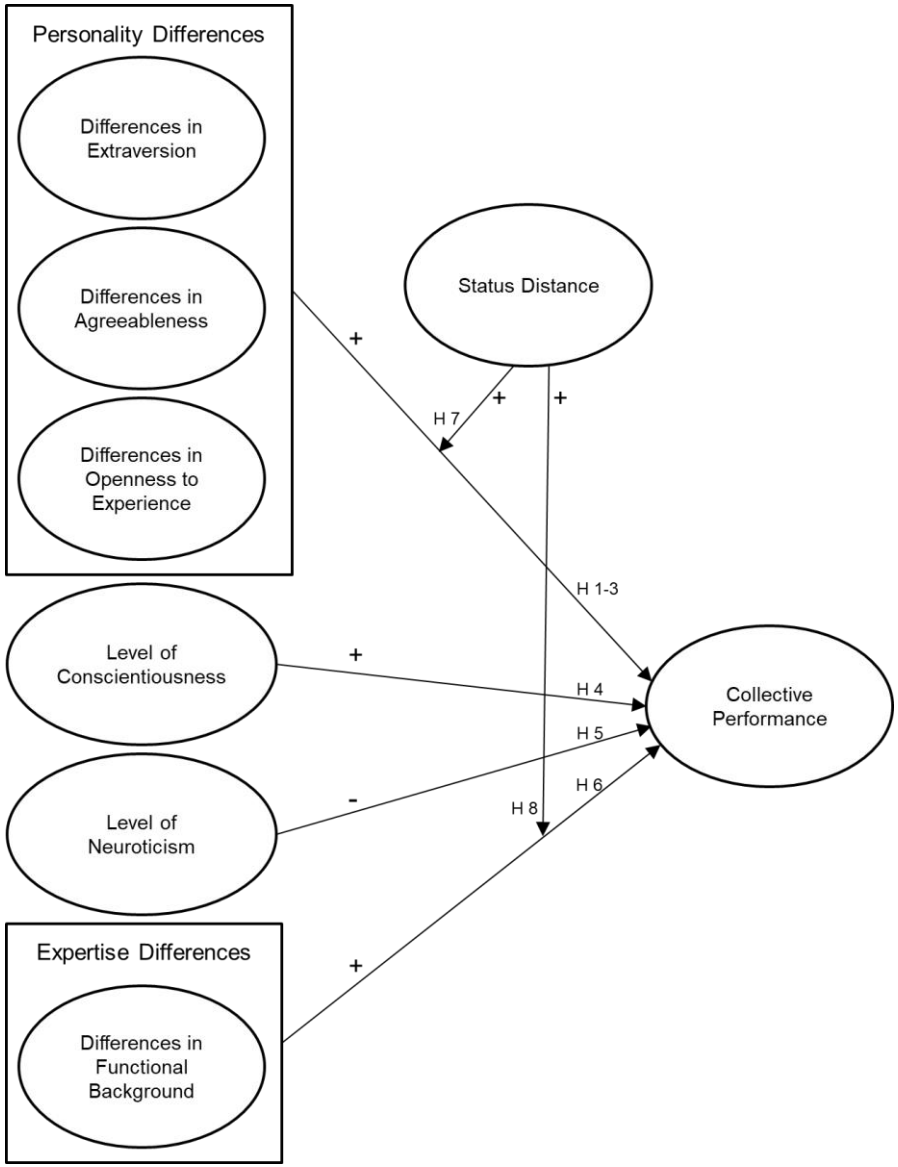
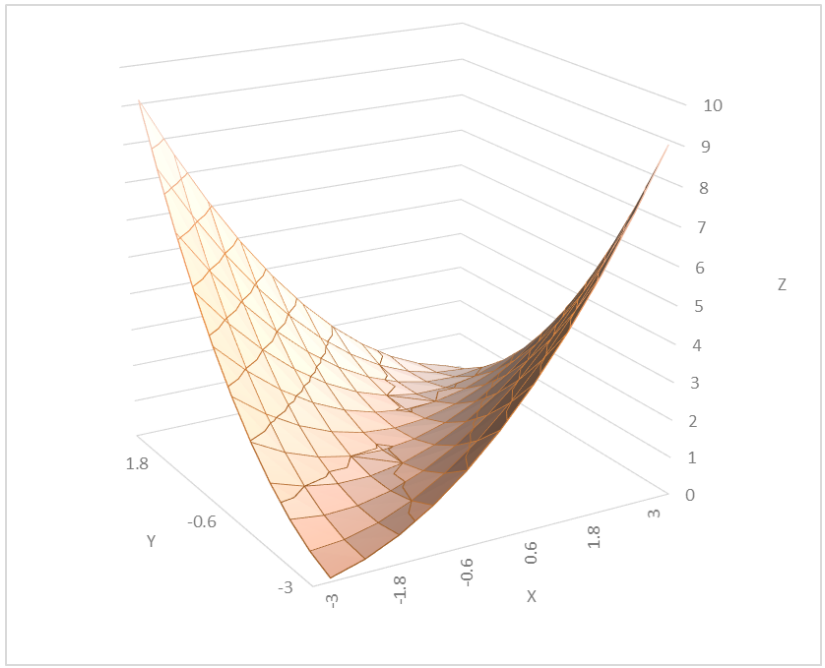


Figure 2: Examples of Response Surfaces

a) Idealized Incongruence Effect



b) Idealized Congruence Effect

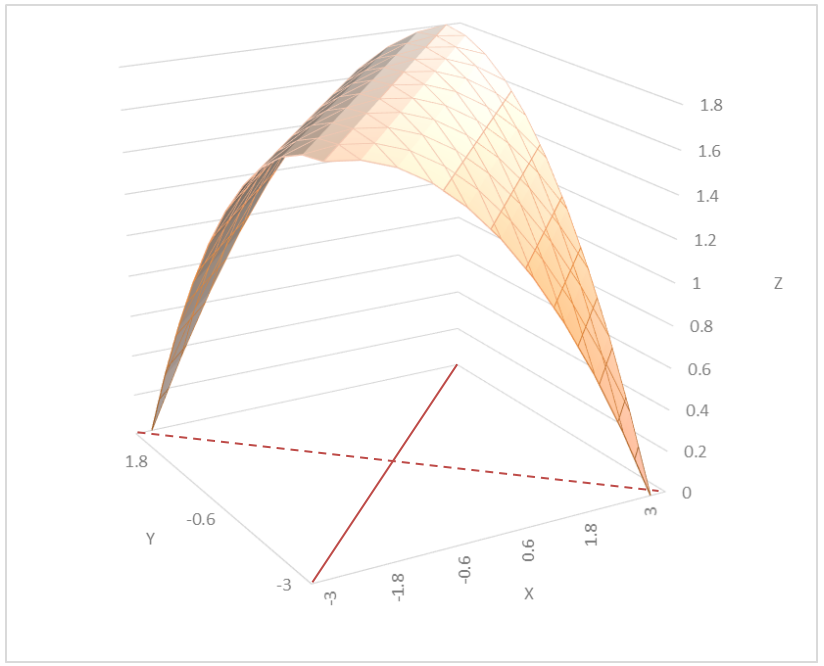


Figure 3: Surface Relating Leader and Second Extraversion (from LSA) to ROA

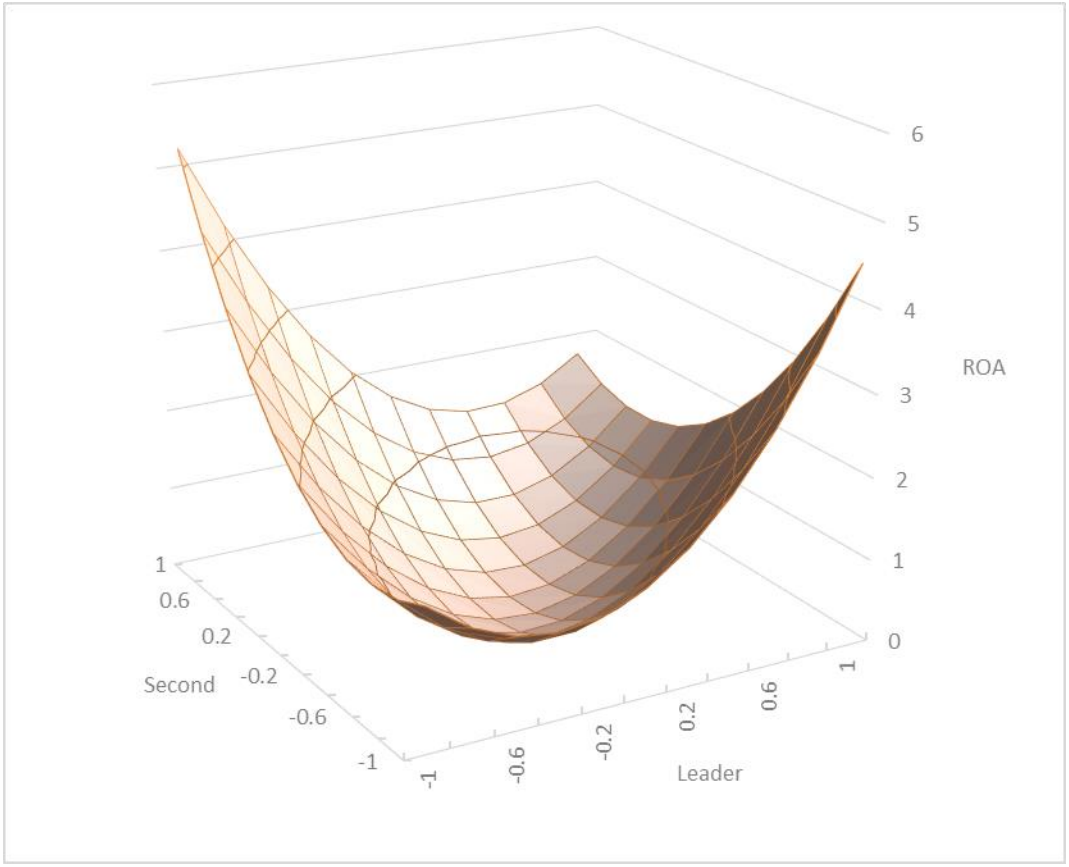


Figure 4: Second Principal Axis for LSA Extraversion

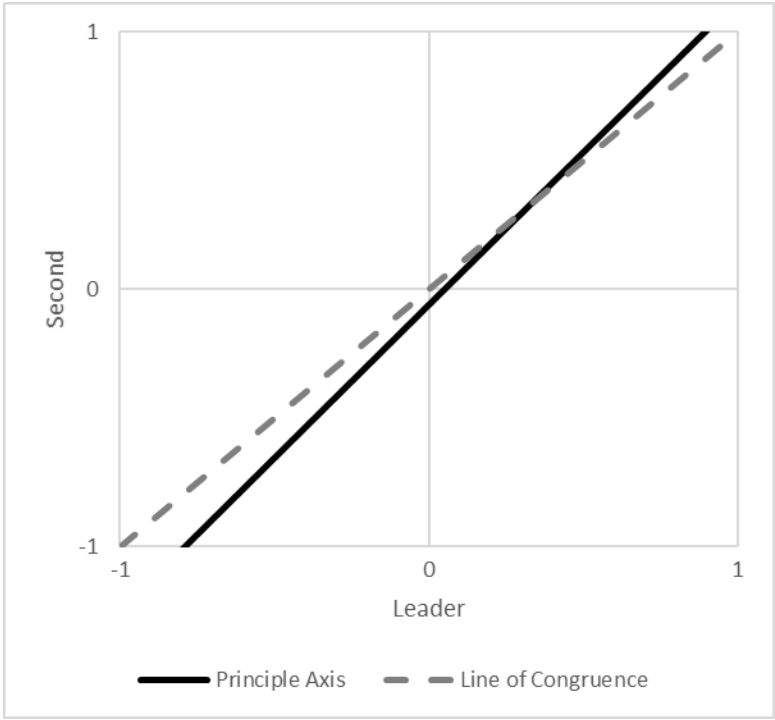


Figure 5: Surface Relating Leader and Second Openness (from IBMPI) to ROA

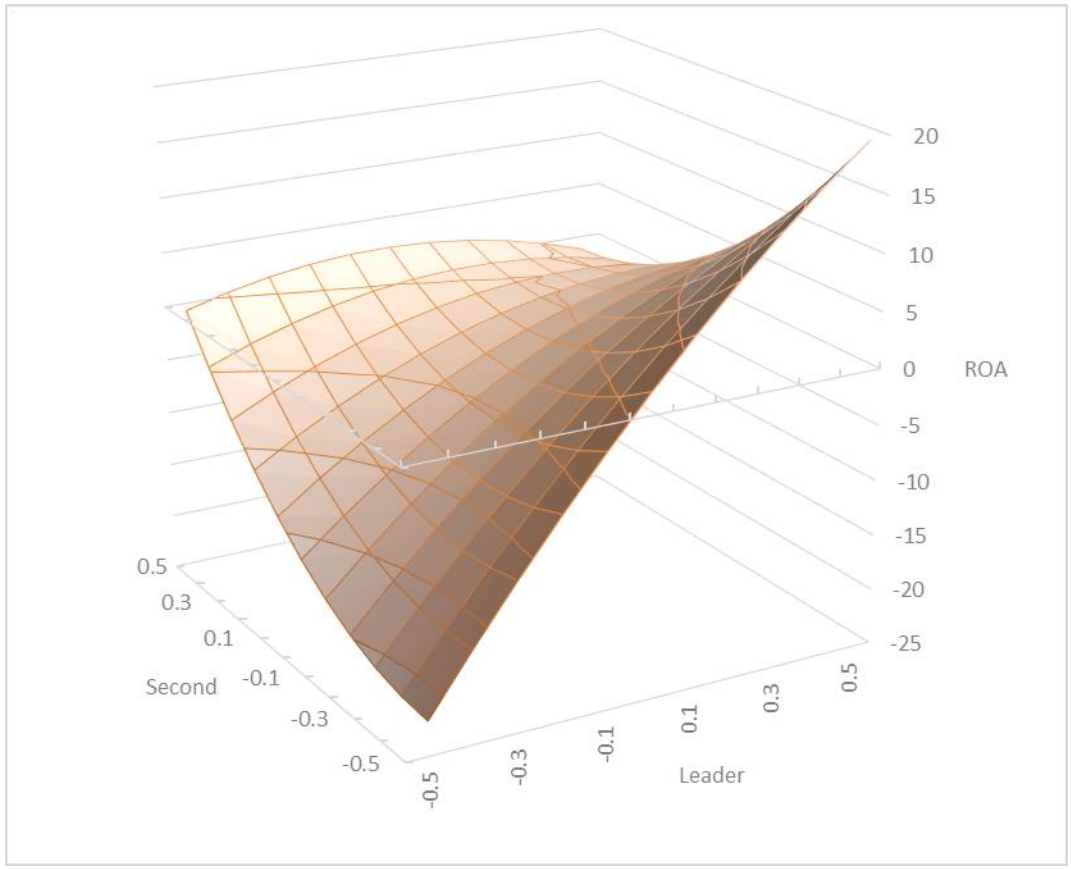


Figure 6: Second Principal Axis for IBMPI Openness

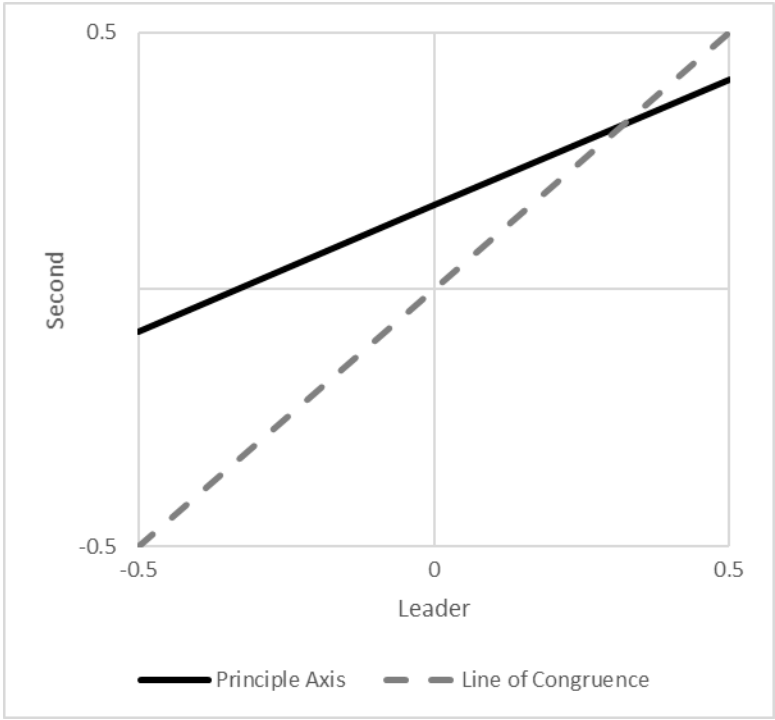


Figure 7: Surface Relating Leader and Second Openness (from LSA) to ROA

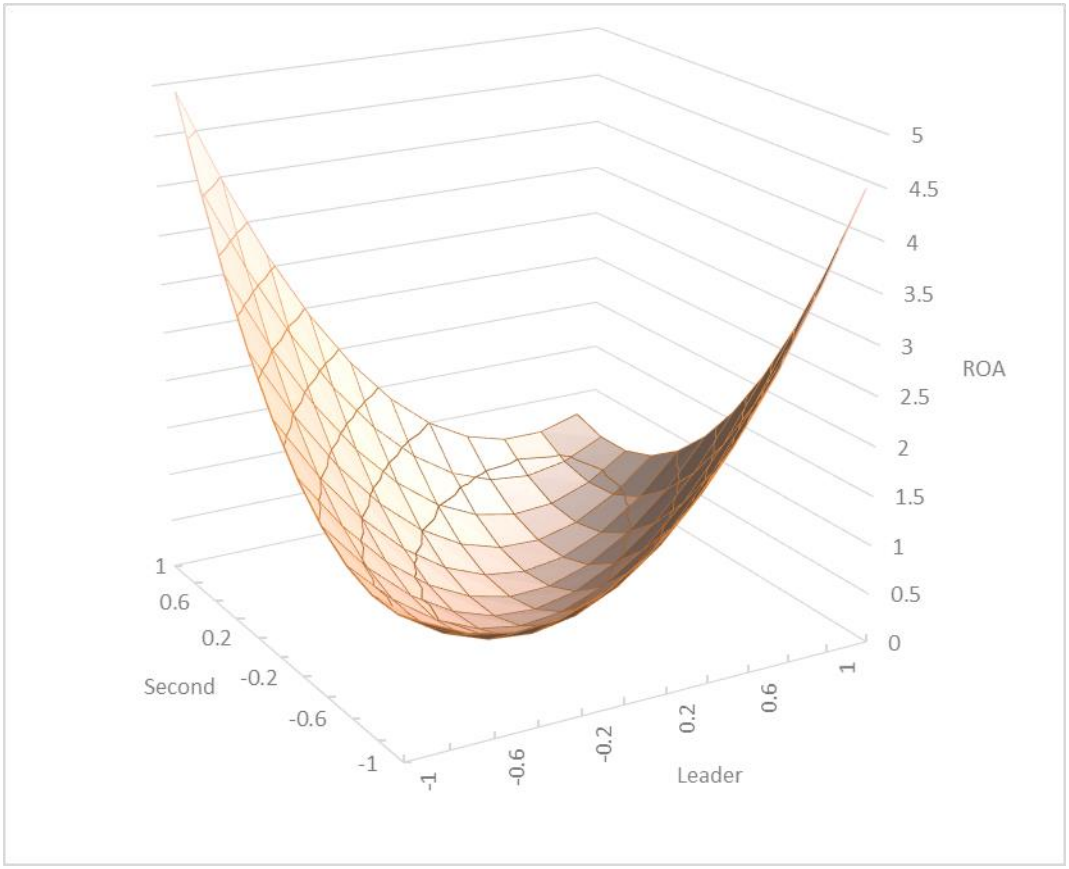


Figure 8: Second Principal Axis for LSA Openness

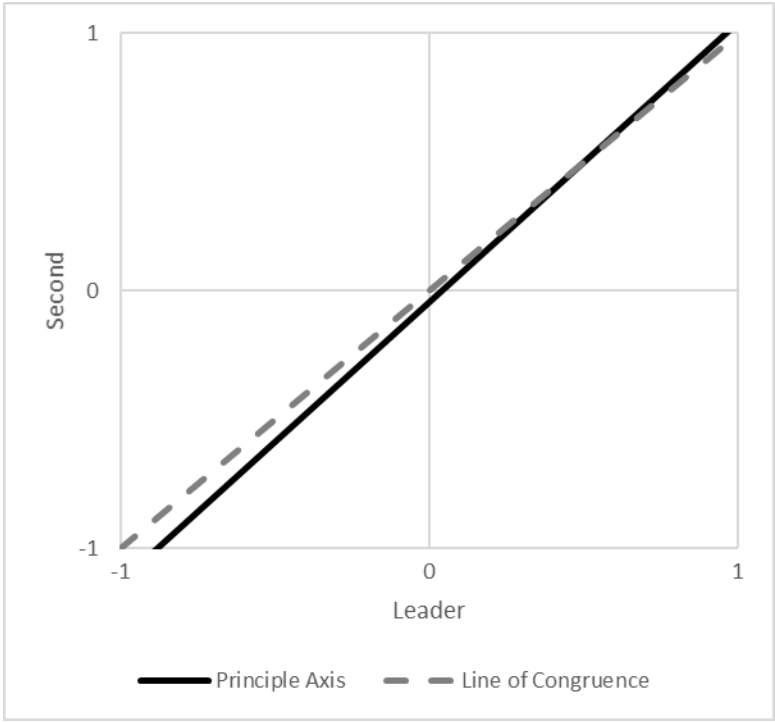


Figure 9: Surface Relating Leader and Second Agreeableness (from IBMPI) to ROA

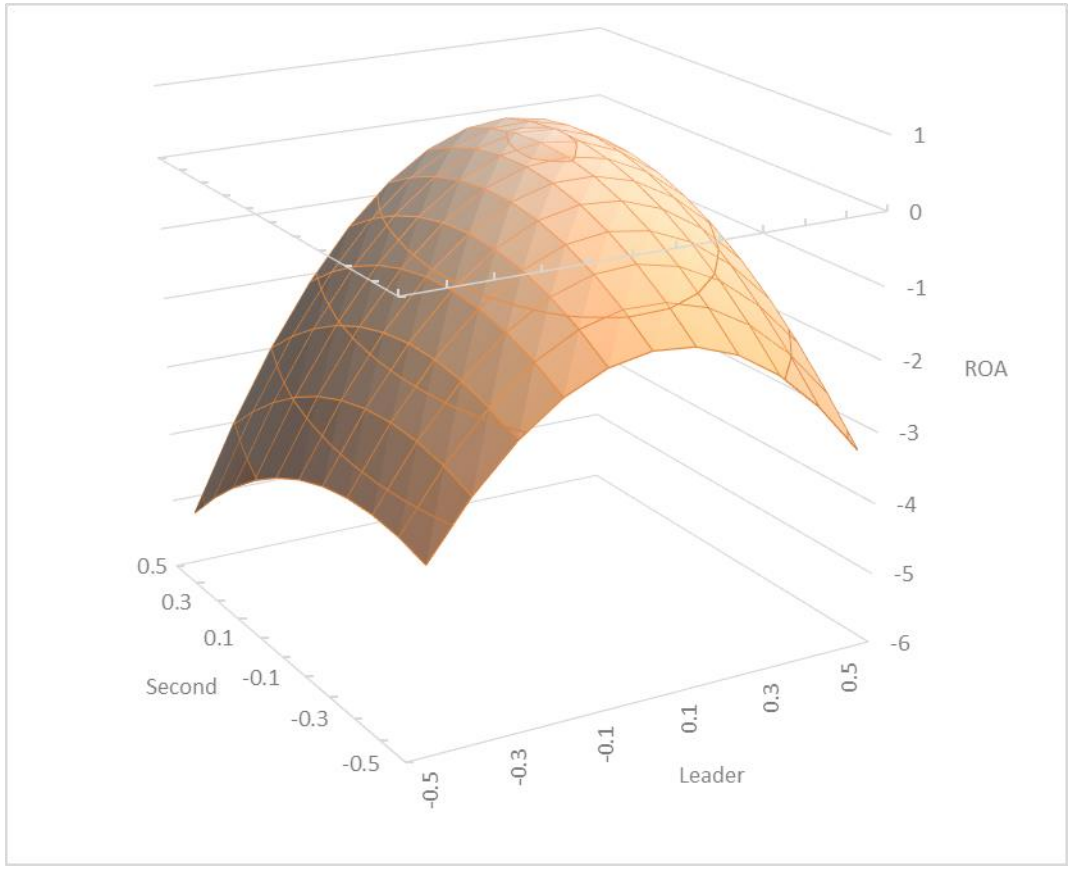


Figure 10: First Principal Axis for IBM Agreeableness

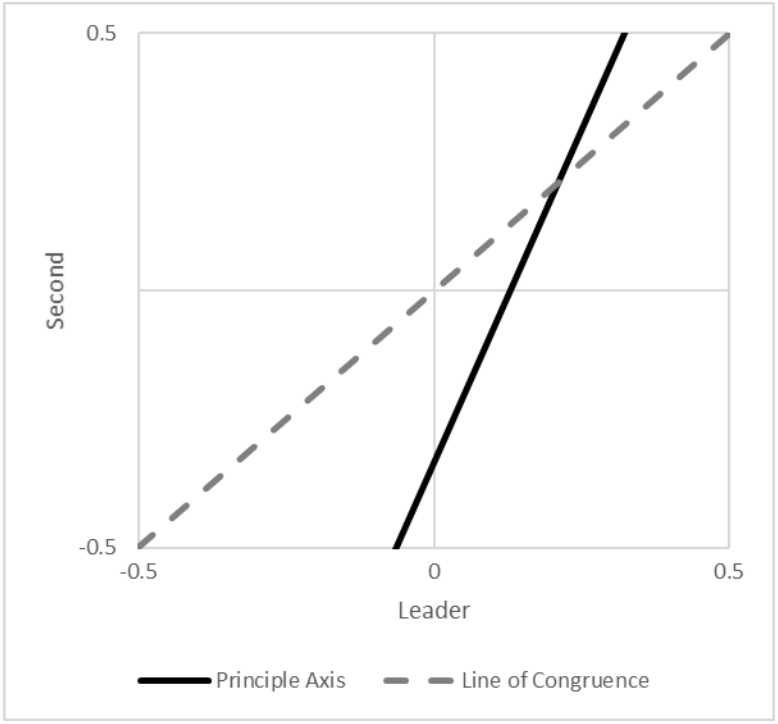


Figure 11: Surface Relating Leader and Second Agreeableness (from LSA) to ROA

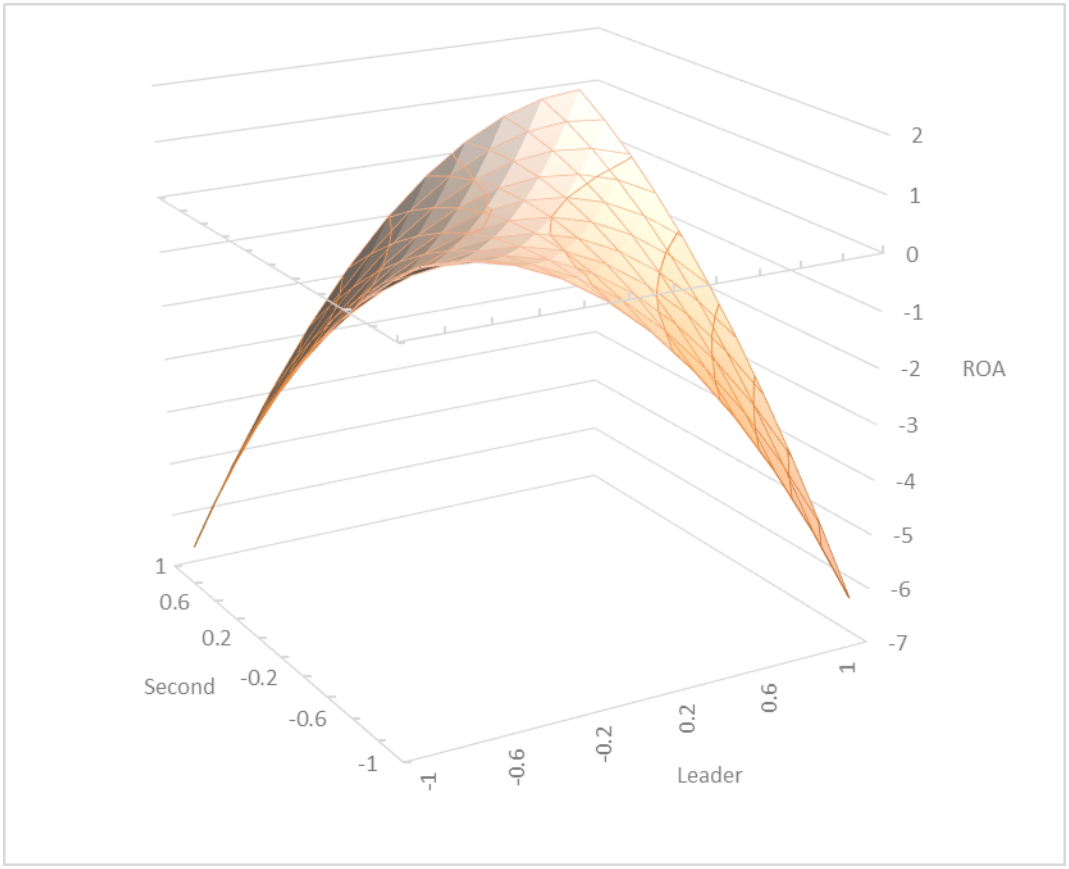


Figure 12: First Principal Axis for LSA Agreeableness

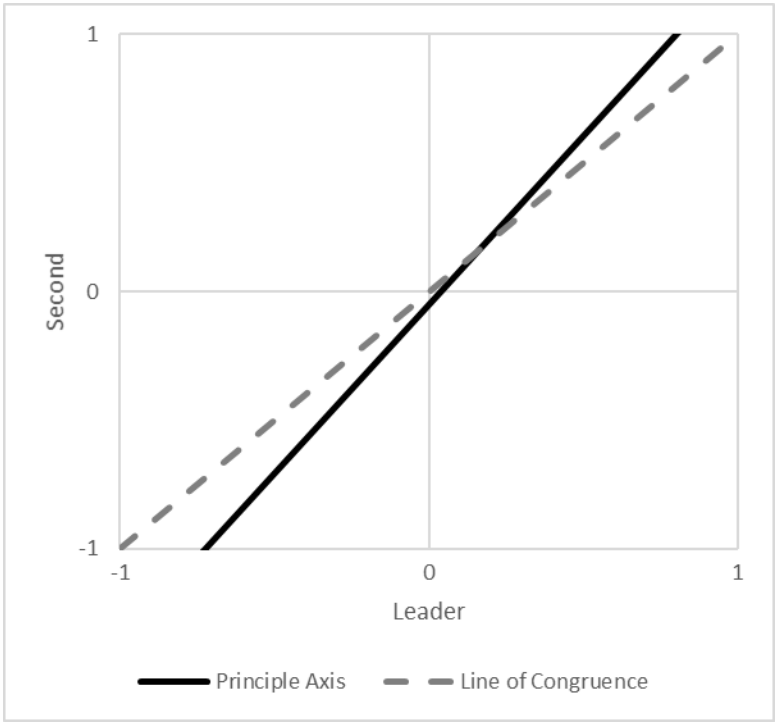


Figure 13: Surface Relating Leader and Second Conscientiousness (from IBMPI) to ROA

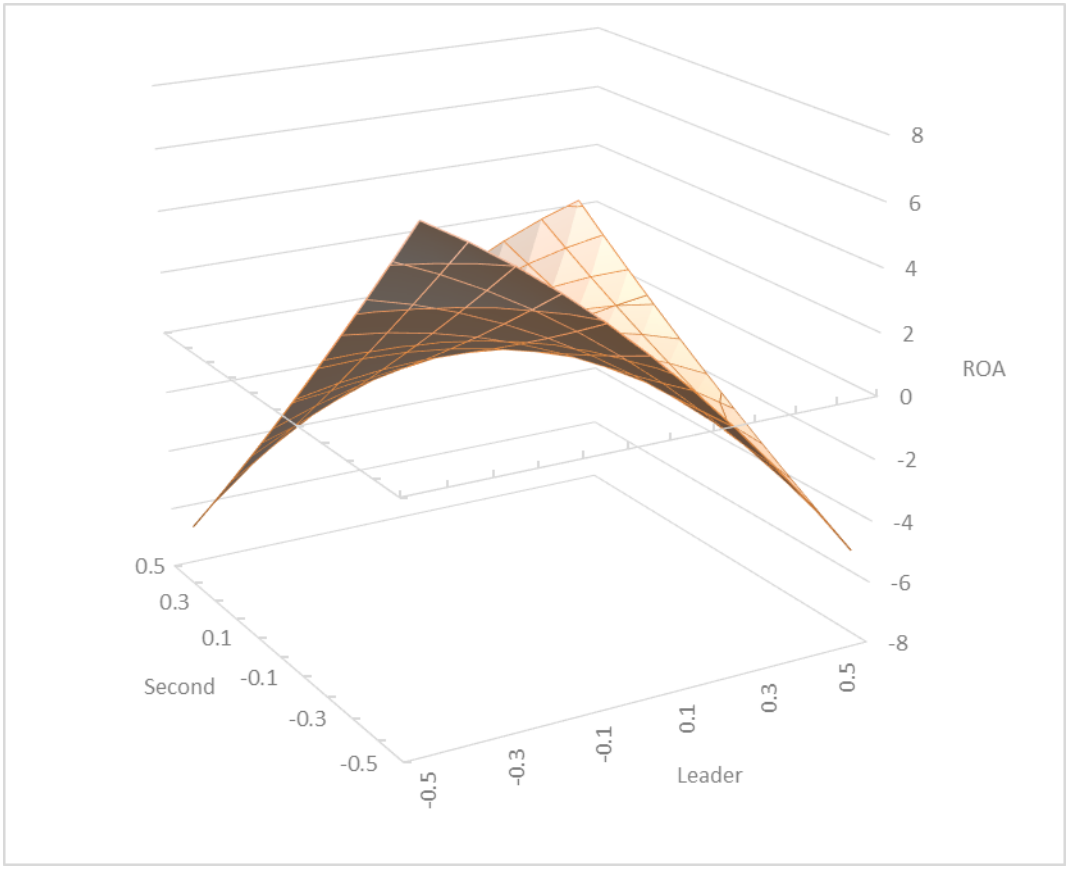


Figure 14: First Principal Axis for IBMPI Conscientiousness

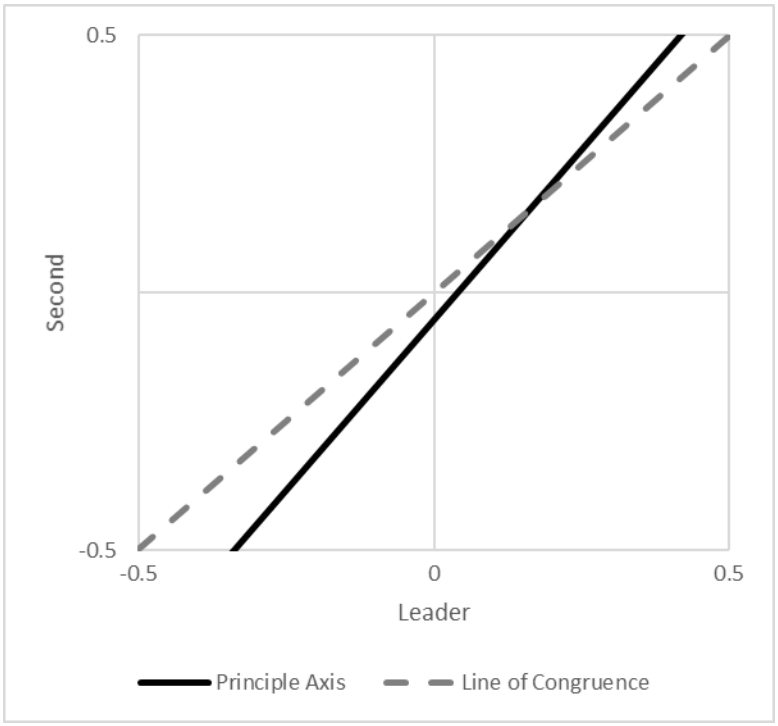


Figure 15: Surface Relating Leader and Second Neuroticism (from IBMPI) to ROA

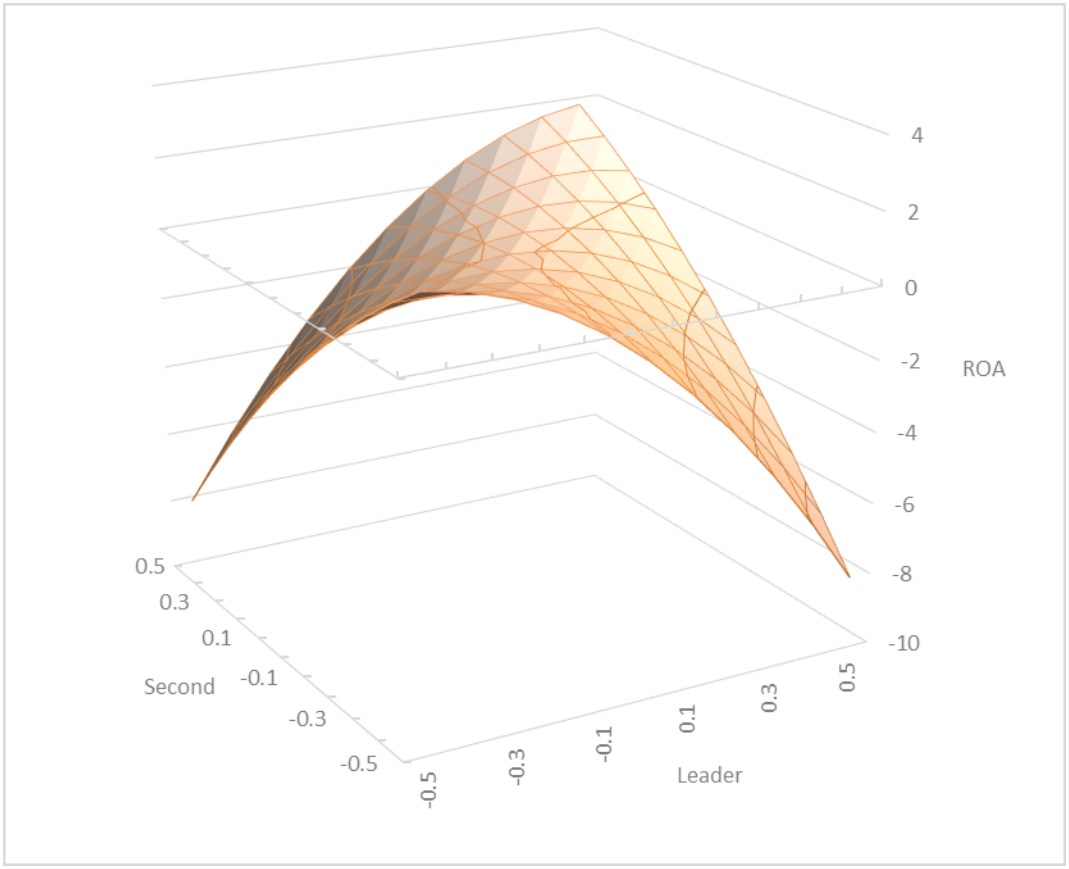


Figure 16: First Principal Axis for IBMPI Neuroticism

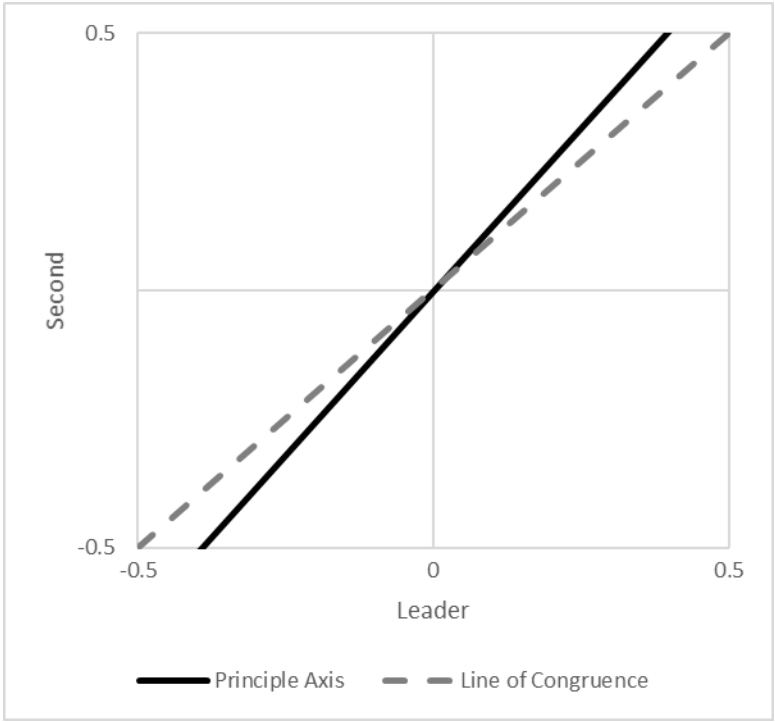


Figure 17: Moderation of the Surface Relating Leader and Second Extraversion (from PRT) to ROA

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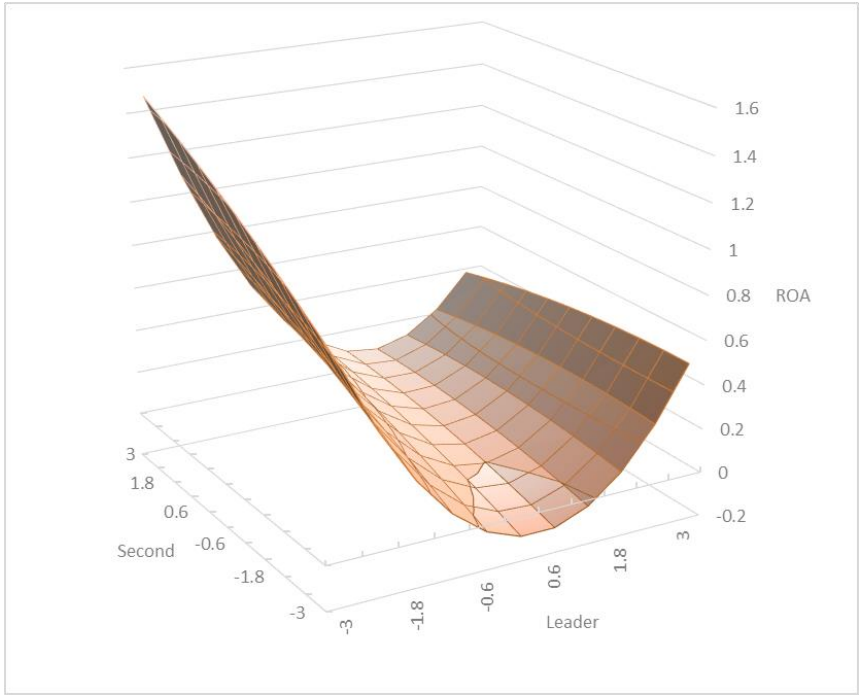

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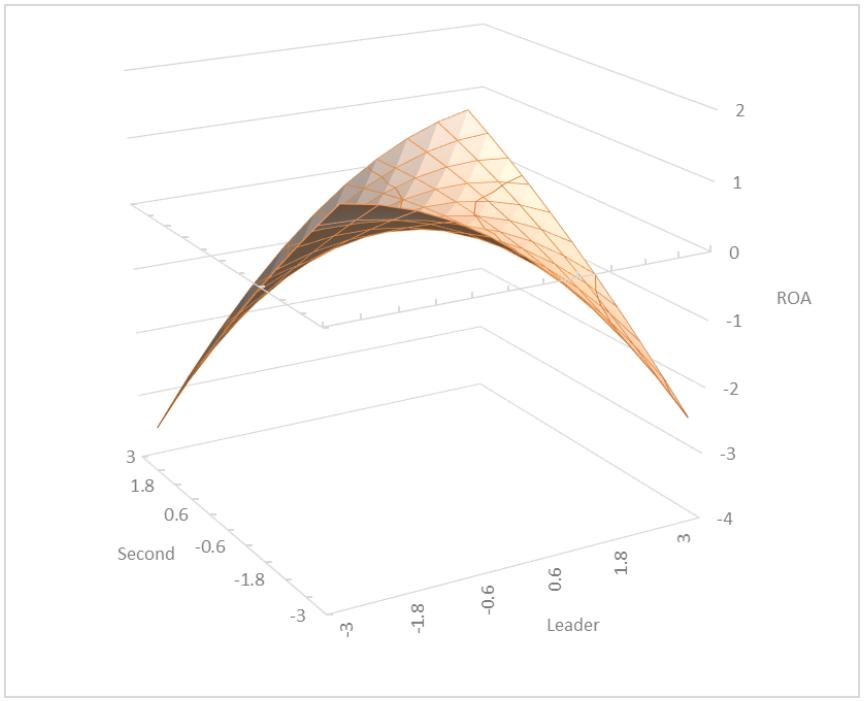

Figure 18: Moderation of the Surface Relating Leader and Second Extraversion (from IBMPI) to ROA

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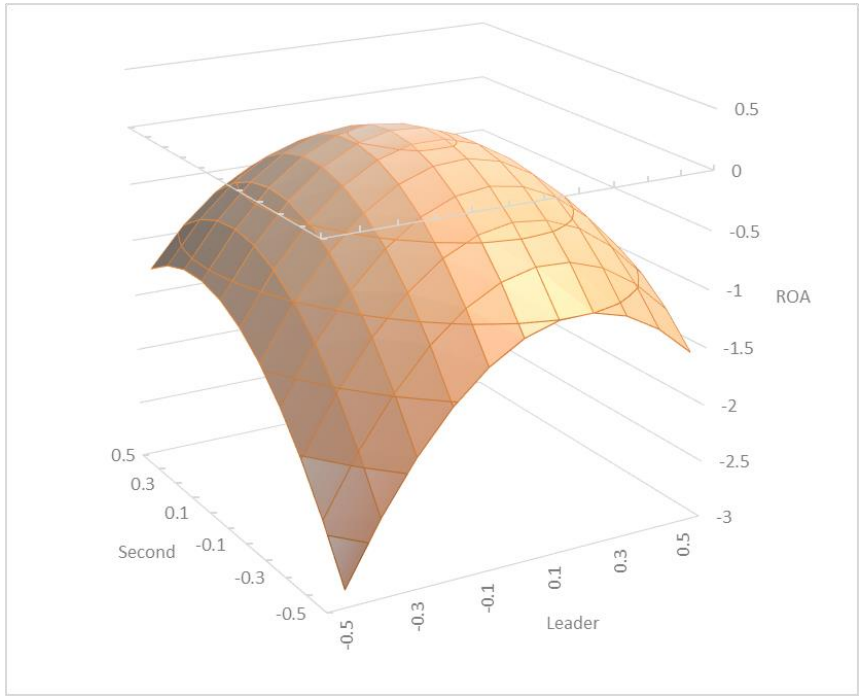

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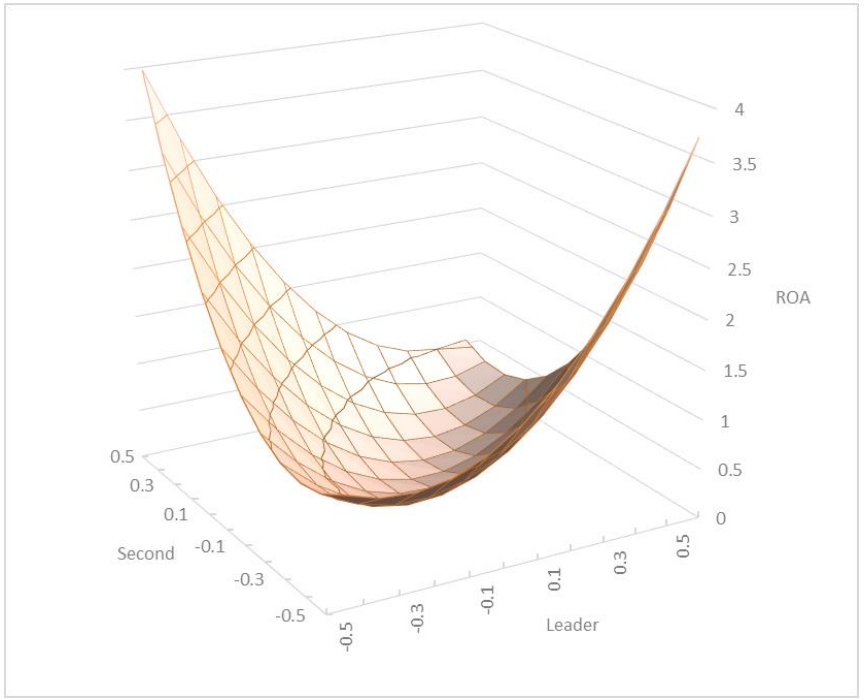

Figure 19: Moderation of the Surface Relating Leader and Second Openness (from PRT) to ROA

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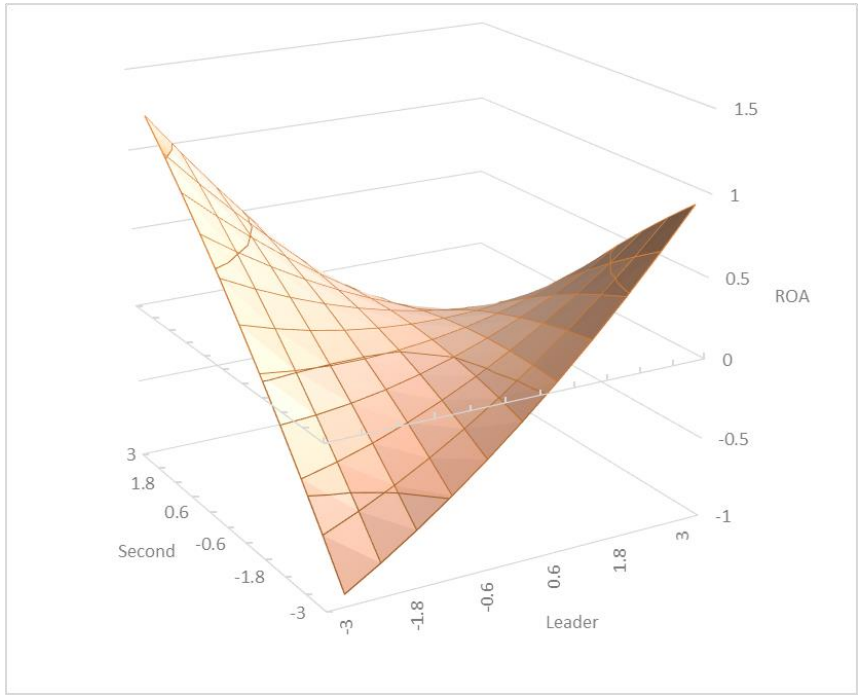

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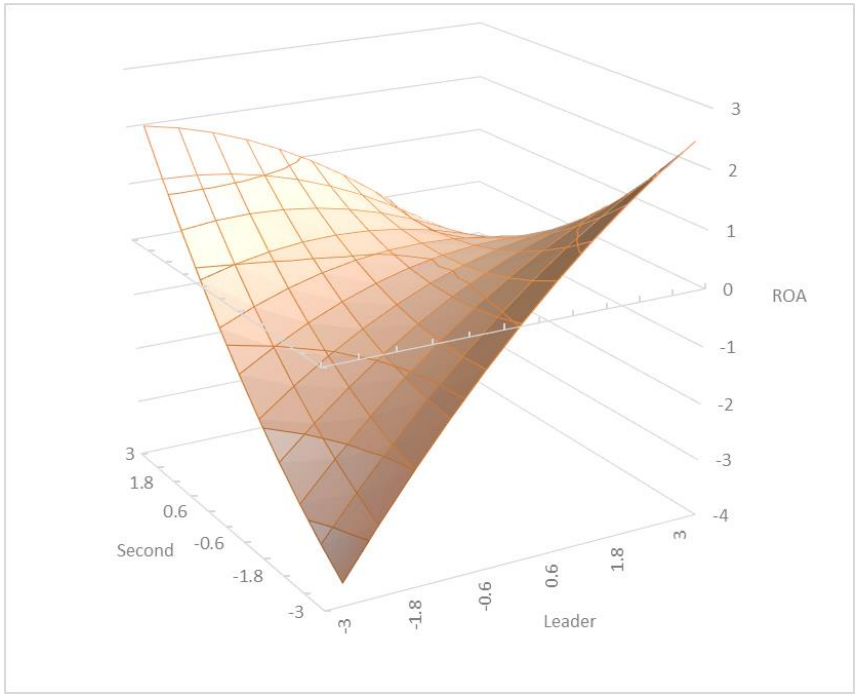

Figure 20: Moderation of the Surface Relating Leader and Second Openness (from IBMPI) to ROA

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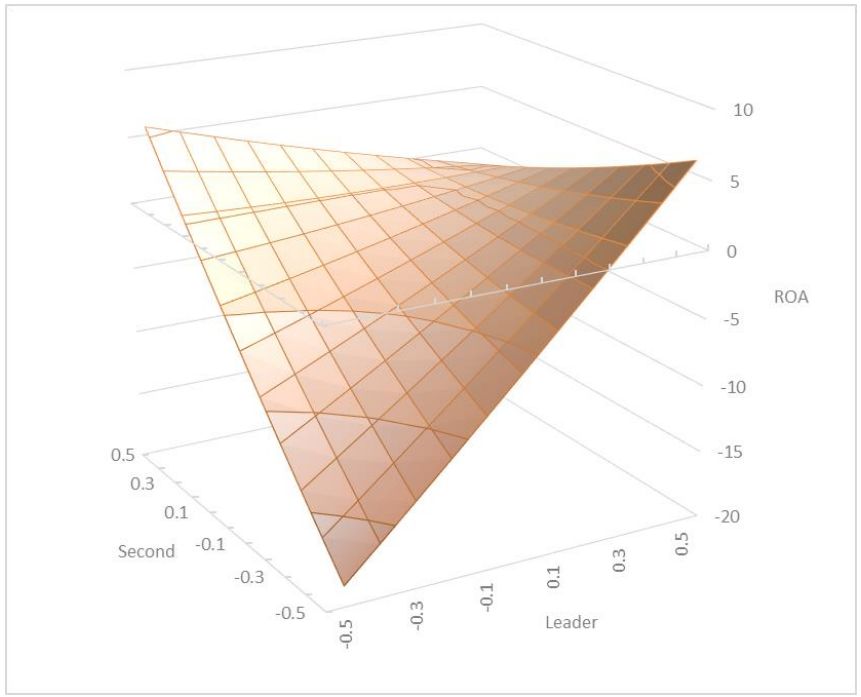

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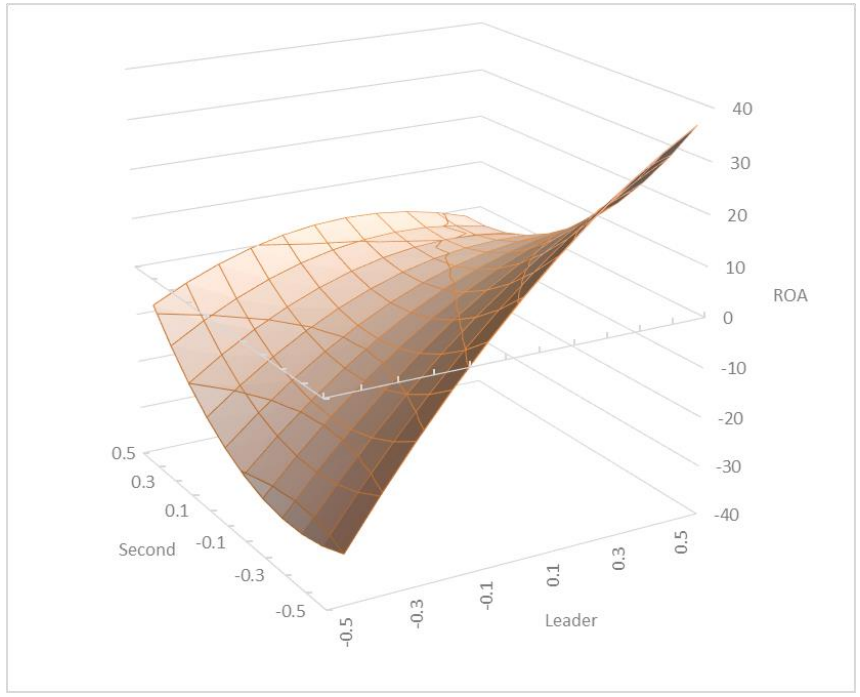

Figure 21: Moderation of the Surface Relating Leader and Second Agreeableness (from PRT) to ROA

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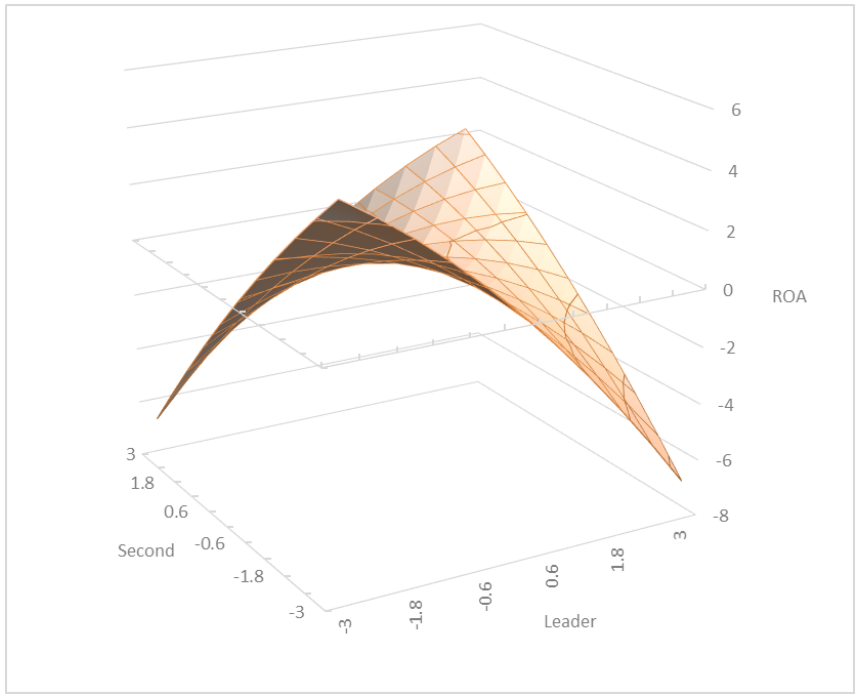

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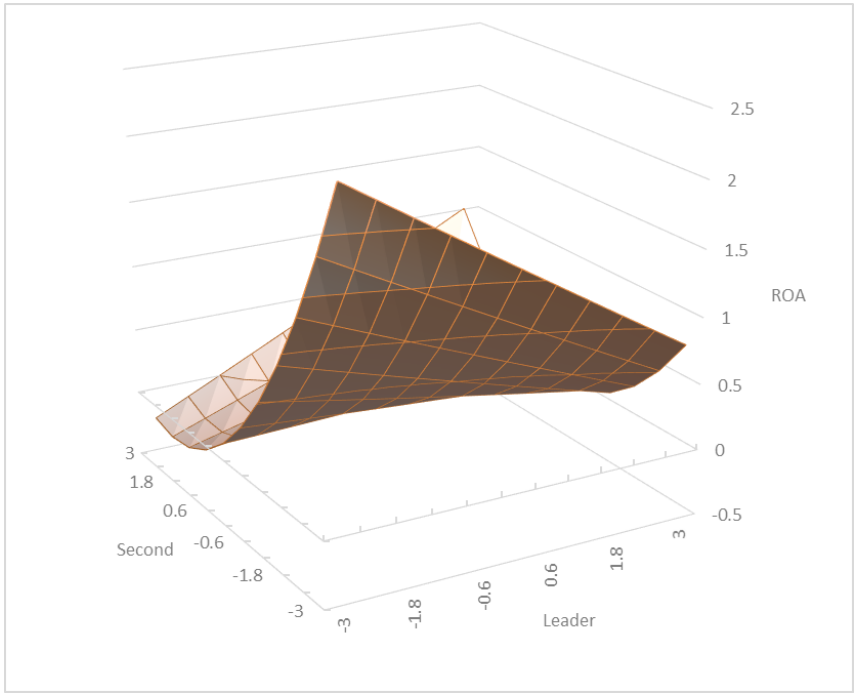

Figure 22: Moderation of the Surface Relating Leader and Second Agreeableness (from IBMPI) to ROA

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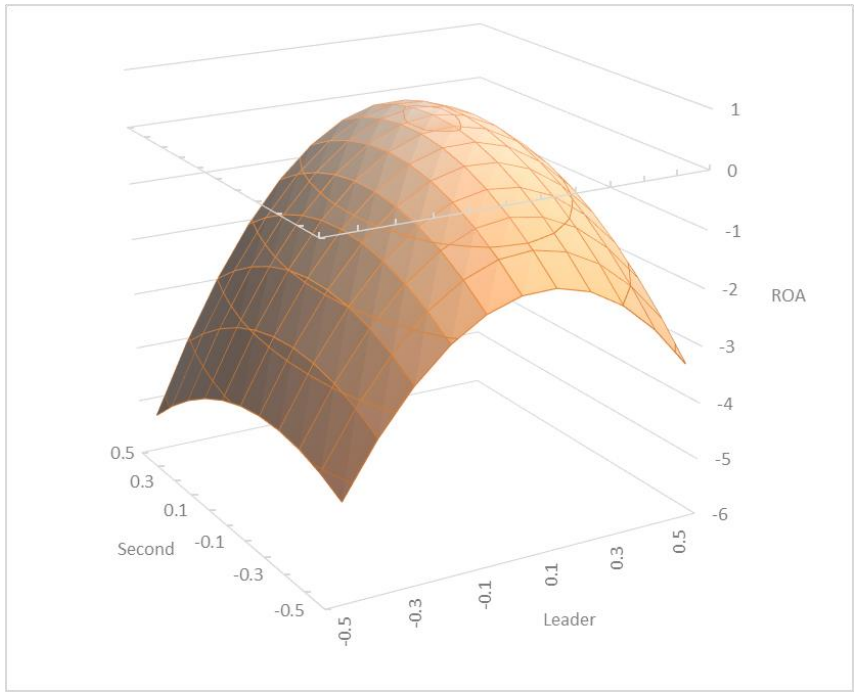

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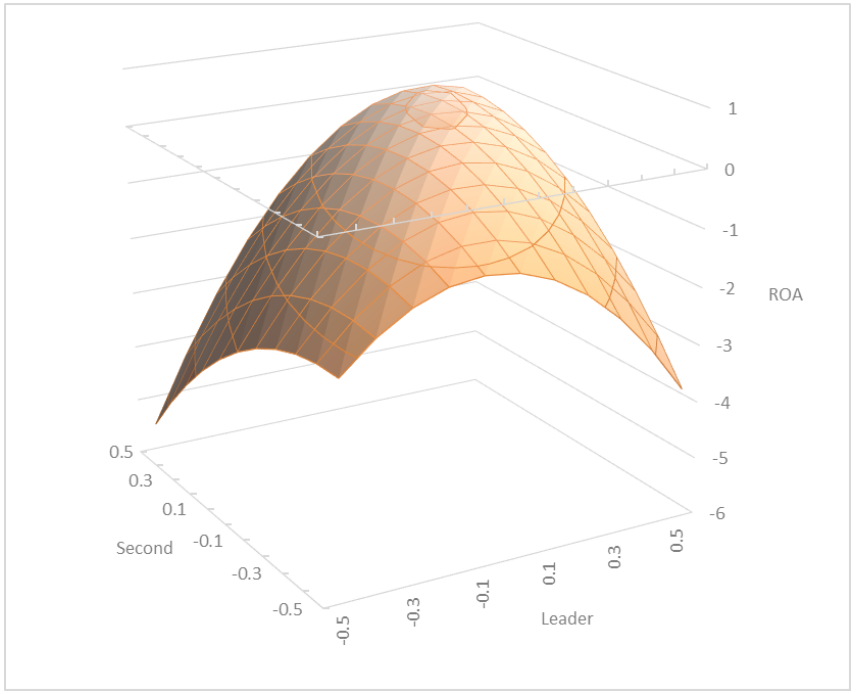

Appendix A: Second Interview Guide

1. Describe your current role?
    a. How long have you been in your current role?
    b. How did you start out in this role?
    c. What were you doing previously?
    d. Do you have experience in previous roles as a leader or as a second-in-command/Number 2?
2. How is your team/organization structured (i.e. who is your boss, who works for you)?
    a. How are decisions made in your team/organization?
    b. How is this similar or different from how most teams/organizations at your level are structured?
    c. What are the advantages and disadvantages of your structure?
3. Do you consider yourself a second-in-command? Why or why not?
    a. Thinking about your role as a second, what are some of the activities you engage in every week?
    b. What kinds of tasks do you work on with your boss?
    c. How are your tasks/responsibilities different from those of your boss?
4. What does it take to be a good second-in-command (personality, skills, knowledge)?
    a. How are those qualities different from what it takes to be a good leader in general?
    b. Do you see yourself as a successful second?
        i. What makes you successful/unsuccessful?
        ii. What do others do to make you successful?
        iii. How do others prevent you from being successful?
5. Generally speaking, what are the benefits and drawbacks of being a second in command?
6. For you personally, what are the benefits and drawbacks of being a second in command?
7. Describe your relationship with your leader.
    a. Can you provide an example of a specific interaction that is emblematic of your relationship?
    b. How are you similar to and different from your leader?
    c. How effectively do you work together?
    d. What, if anything, do you think your leader could do to improve your relationship?
    e. What, if anything, do you think you could do to improve your relationship?
8. How did you become the second in command?
    a. Describe your relationship with your leader prior to the current role?
    b. How did you choose to become second-in-command?
9. What is next for you in your career?

10. Tell me about a time when you or someone you know acting as a second did something that helped your team/organization succeed? (need specifics on the position of the person if they did not use themselves as an example)
    a. What happened? (series of events, behaviors, actions, etc.)
    b. What were the outcomes?
11. Tell me about a time when you or someone you know acting as a second did something that helped contribute to a failure in your team/organization? (need specifics on the position of the person if they did not use themselves as an example)
    a. What happened? (series of events, behaviors, actions, etc.)
    b. What were the outcomes?

Appendix B: Leader Interview Guide

1. Describe your current role?
    a. How long have you been in your current role?
    b. How did you start out in this role?
    c. What were you doing previously?
    d. Do you have any experience in previous roles as second-in-command or as a leader working with a second-in-command?
2. What qualities do you look for in a second-in-command (personality, skills, knowledge)?
    a. How are those qualities different from what it takes to be a good leader in general?
3. Generally speaking, what are the benefits and drawbacks of having a second-in-command?
4. In your current role what are the benefits and drawbacks of having a second-in-command?
5. Describe your relationship with your current second-in-command.
    a. Can you provide an example of a specific interaction that is emblematic of your relationship?
    b. How are you similar to and different from your second-in-command?
    c. How effectively do you work together?
    d. How much difference in power/status is there between you and your second-in-command?
    e. What do you do as a leader to help your second-in-command be successful?
    f. How effective is your current second-in-command?
        i. What makes them successful/unsuccessful?
    g. What, if anything, do you think your second-in-command could do to be more effective?
    h. What, if anything, do you think you could do to improve your effectiveness as a pair?
6. How did you come to work with your current second-in-command?
    a. Did you have a prior relationship with them?
    b. How did you select them?
7. How would you describe the environment in which your organization operates?
    a. Would the qualities you look for in a second-in-command be different if the environment were different?

Appendix C: Codes Used in Qualitative Data Analysis

- Category: Expertise Similarity
  - Sub-category: Education Similarity
    - Code: Same/Different formal training
      - Sub-code: Formal training type
    - Code: Same/Different informal training
      - Sub-code: Informal training type
    - Code: Same school
    - Code: Similar/Dissimilar school
  - Sub-category: Experience Similarity
    - Code: Same/Different industry
      - Sub-code: Industry experience
    - Code: Same/Different organization type
      - Sub-code: Org type experience
    - Code: Same/Different organization culture
      - Sub-code: Org culture experience
    - Code: Same/Different roles
      - Sub-code: Prior role types
    - Code: Same prior leader
      - Sub-code: Prior mentors/leaders
    - Code: Same prior organization
      - Sub-code: Prior organizations
- Category: Psychological Similarity
  - Sub-category: Personality similarity
    - Code: Openness similarity
      - Sub-code: Openness levels self
      - Sub-code: Openness levels other
    - Code: Extraversion similarity
      - Sub-code: Extraversion levels self
      - Sub-code: Extraversion levels other
    - Code: Agreeableness similarity
      - Sub-code: Agreeableness levels self
      - Sub-code: Agreeableness levels other
    - Code: Conscientiousness similarity
      - Sub-code: Conscientiousness levels self
      - Sub-code: Conscientiousness levels other
    - Code: General personality similarity
  - Sub-category: Cognitive Similarity
    - Code: Decision-making comprehensiveness similarity
      - Sub-code: Decision-making comprehensiveness self
      - Sub-code: Decision-making comprehensiveness other
    - Code: Time horizon similarity
      - Sub-code: Time horizon self
      - Sub-code: Time horizon other

        - Sub-category: Needs Similarity
            - Code: Need for power similarity
                - Sub-code: Need for power self
                - Sub-code: Need for power other
            - Code: Need for achievement similarity
                - Sub-code: Need for achievement self
                - Sub-code: Need for achievement other
            - Code: Need for affiliation similarity
                - Sub-code: Need for affiliation self
                - Sub-code: Need for affiliation other
        - Sub-category: Other Similarity
            - Code: Values similarity
            - Code: Shared goals
- Category: Hierarchical Distance
    - Sub-category: Power differences
        - Code: Formal power differences
        - Code: Personal power differences
        - Code: Power striving
            - Sub-code: Power conferred by leader
            - Sub-code: Power developed by self
    - Sub-category: Status differences
        - Code: Differences in respect conferred by followers
        - Code: Differences in respect conferred by outsiders
        - Code: Status striving
            - Sub-code: Respect publically conferred by leader
            - Sub-code: Respect earned by self
- Category: Roles
    - Sub-category: Role differentiation
        - Code: Distinct roles
            - Sub-code: Horizontal Differentiation
            - Sub-code: Vertical Differentiation
        - Code: Complementary roles
        - Code: Role confusion/conflict
    - Sub-category: Role types
        - Code: Manager role
        - Code: Advisor role
        - Code: Outside interface role
        - Code: Inside operations roles
        - Code: Mentor role
        - Code: Disciplinary role
        - Code: Visionary role
        - Code: Intermediary role
        - Code: Surrogate role
        - Code: Social cohesion role
- Category: Effectiveness
    - Sub-category: Decision-making effectiveness

        - Code: Decision speed
            - Sub-code: High speed decision
            - Sub-code: Low speed decision
        - Code: Decision quality
            - Sub-code: High quality decision
            - Sub-code: Low quality decision
        - Code: Decision buy-in
            - Sub-code: High decision buy-in
            - Sub-code: Low decision buy-in
- Sub-category: Group/follower Performance
    - Code: Group/follower successes
    - Code: Group/follower setbacks
- Sub-category: Leader-second relationship effectiveness
    - Code: High quality relationship
    - Code: Low quality relationship
- Sub-category: Change effectiveness
    - Code: Successful change
    - Code: Change resistance/failure

Appendix D: Lists of Words Used to Construct LSA Trait Vectors

Openness: original, novelty, curious, different, ingenious, active, imaginative, inventive, artistic, aesthetic, reflective, sophisticated, musical, literate, unpredictable, fearless, open, creative, adventurous, explore, brave

Conscientiousness: conscientious, thorough, accurate, reliable, organize, diligent, persevere, persevering, efficient, plan, persistent, focus, careful, work, painstaking, meticulous, scrupulous, particular, selfless, empathetic

Extraversion: talkative, outgoing, energetic, enthusiastic, boisterous, assertive, eager, friendly, sociable, lively, social, open, chatty, meet, interaction, energized, public

Agreeableness: agreeable, helpful, unselfish, altruistic, agree, agreement, forgiving, trusting, warm, friendly, considerate, kind, polite, cooperative, easygoing, accommodating

Neuroticism: neurotic, depressed, blue, agitated, stressed, worry, emotional, unstable, upset, moody, restless, tense, nervous, anxiety, compulsive, obsessed, indecisive, maladjusted, anxious, uneasy, irritable

*Based on Kwantes et al. (2016)

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